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The Measurement of Gas Temperatures

THE all-day discussion staged by the Institute of Fuel on December 2, on the subject of the measurement of gas temperatures will have served a useful purpose if it crystallises the practice of industry upon this important subject. The concepts of modern physics show that the energy of a gaseous mass may take many forms, most of which may be expressed in terms of temperature, but not all of which appears as temperature in the sense understood by thermometric measurement. The problem is, in point of fact, exceedingly difficult when—as is usual in industrial processes—the hot gas is not in thermal equilibrium. Energy may be carried in a gas, for example, by electro-magnetic radiation, as the energy of chemical combination, as potential electrostatic energy, or in one of the various forms of kinetic energy.

These various forms of energy each may take up a certain proportion of the energy entering the system and form "energy flow traps." By measuring the specific properties of the various energy traps, different temperatures, known as "pseudo-temperatures," will be obtained. For example, the temperature of sodium vapour in certain electric discharge lamps has been estimated as 2,000 to 3,000° C. on the basis of the apparent radiation of the excited atoms, whereas the average temperature of the gas has been found to be at the most 200 to 300° C. A measuring instrument will, therefore, take up a temperature between the several pseudo-temperatures, but this will not be an average or mean temperature with a clearly defined physical significance.

One of the prime causes of incorrect readings in a gas is the interchange of radiation between the thermocouple (or other measuring instrument) and the containing walls. In a boiler this radiation may amount to 70,000 B.Th.U. per sq. foot of body space surface per hour in the hotter parts. The conference devoted a good deal of time to the discussion of two methods of avoiding this error. It was pointed out mathematically that a thermocouple of zero diameter will give the correct reading under all conditions. If, therefore, three or more thermocouples of different diameters with the smallest one of as small a diameter as the conditions warrant, and all preferably of low emissivity, be exposed in the gas stream, it is possible from the three readings to extrapolate to the theoretical condition of the thermocouple of zero diameter. The second method was to surround the thermocouple with a sheath which will take up some temperature between that of the thermocouple and the walls, and thus minimise the error due to radiation. If two or more of these sheaths be used, and if they be of low emissivity, the results will be practically accurate. The accuracy may be still further improved by drawing a current of the gas through the sheaths and over the couple, the instrument being then known as a "suction pyrometer." The greater the gas velocity, the more accurate the readings, complete accuracy being attained only at infinite velocity.

Space does not permit reference to all the numerous points of interest made in the papers submitted to the conference, but room must be found for a brief reference to the excellent survey by Mr. J. C. Swallow of the problems of gas temperature measurement in the chemical industry. (Extracts from his paper are given on page 443). Accurate temperature measurements are needed for control of operations and for obtaining heat transmission coefficients. The chemical industry, however, puts emphasis on the problem of maintenance rather than of accuracy, because when controlling continuous processes, the life of the instrument and its ability to maintain its characteristics are of prime importance. An important point made by Mr. Swallow is that the problem of plant control can generally be simplified if the thermometer is correctly placed.

The sensitivity of thermocouples may be increased by welding the tip of the couple to the bottom of the metal sheath. The need of sheathing thermocouples in chemical plants is a cause of low sensitivity; another cause of lag inherent in large plant is that changes in the indicator may sometimes occur a considerable time after a change in the conditions has been made, due simply to the size of the plant. The corrosion of sheaths can only be prevented if the material of the sheath is carefully selected. Where gases are highly corrosive, a heat-resisting metal sheath may have to be used. Chromium and chromium-nickel steels are good for avoidance of corrosion, but if the gases to be measured contain sulphur dioxide, straight high chromium steels containing 30 per cent. Cr are recommended.

There are many theoretical complications involved in the concept of gas temperature as compared with, say, the temperature of a solid or a liquid. . . . These theoretical complications have practical consequences which are becoming increasingly serious with the rapid advances in the technique of heat transfer.

—*J. G. Bennett and M. Pirani.*

NOTES AND COMMENTS

The New National Service

WHATEVER the individual's view may be about foreign affairs and the inevitability or otherwise of war, his life is going to be differently ordered when the Government's scheme of national service is put into operation. It is true that the outline which Sir John Anderson gave to the House of Commons was of a voluntary scheme. Not only, however, does compulsion stand behind it should the dread emergency arise, but there can be no doubt of the patriotic response of all but an insignificant minority of the nation. It follows that most households and every business will be affected in greater or less degree by an appeal of a kind never before heard in peace-time. So far as business is concerned the chief problem will centre round the official list of key occupations which would become so essential to the war effort of the nation that persons above a certain age who are engaged in them could not be spared for any other form of national service. Certainly the chemical industry touches a vital spot in national life. The question of the key men proved the thorny one in the Great War, and it is a consolation at least to think that in 1938 there can be a voluntary plan which should eliminate many of the mistakes and most of the waste made 20 years before.

Key Men in the Chemical Industry

STILL, the chemical industry will have to be very much on its guard. The official mind has its qualities, but it is often rigid and unimaginative. It will be for the industry to peg out claims for key men in good time, not in their interest, but in that of the nation at large. What at all costs has to be avoided now is the training of a volunteer for a war-time task which he would not be able to discharge because it was held to be more necessary in the national interest that he should continue in his normal employment. Business men and their staffs can be depended upon to co-operate whole-heartedly with the authorities in making their scheme a triumphant success. A contributory factor will be a reasonable spirit in approaching the world of business, which has not only reserves of man-power, but provides the Chancellor of the Exchequer with the financial sinews of war.

Extension of Patents

LETTERS patent granted for an invention in this country give the inventor a monopoly of working for a period of sixteen years, after which time the invention becomes public property and can be utilised by anyone so desiring. This is based on the principle that the inventor, having fully described his invention to the public is entitled to this period of monopolistic working as reward. Cases have been known in which the inventor hints that his monopoly has expired before he has had time to turn his invention to good commercial account, and his invention has become public property without his receiving any substantial reward. These cases are, however, of rare occurrence, but it is easy to see in what way they might arise. The invention might be of such limited application that the inventor could not hope to receive adequate benefit from it in the statutory period of sixteen years; for example, some years ago application was made for the extension of a patent granted for an invention relating to a new or improved lock-gate. Again, the inventor might find it necessary to expend a considerable sum on exploiting his invention without receiving an adequate return during his monopoly. A case of this nature occurred last week, when Stream-Line Filters, Ltd., and Dr. H. S. Hele-Shaw petitioned for an extension of two patents, one relating to the form of construction of a filter, and the second to the material used for filtration. It was held that the second patent should be extended because it showed a sufficient degree of ingenuity, together with great utility to the public, and because the petitioner had received inadequate remuneration from the invention. This case serves as a useful reminder that the Courts do provide a remedy for the inventor who can show that he has not been adequately benefited by this term of patent monopoly, provided, of course, that he has not unduly delayed exploiting his invention.

Judgment in the Typhoid Test Action

THE judgment given in the test action arising out of the Croydon typhoid epidemic of a year ago can cause little surprise. It was held that the obligation on the Corporation was limited to the exercise of all reasonable care and skill to ensure that the water provided was pure and wholesome. Analyses of the water at the Addington well were discontinued by an oversight in April, 1937. Chlorination was abandoned in the middle of September and resumed on November 1, workmen being engaged in repair work in the well during part of this time. The Corporation was, therefore, held negligent, and damages were awarded against it. The judgment also stressed that the trouble largely originated from the fact that there was no established policy in operation regarding chlorination, nor a proper system of inspection to see that such a policy was being efficiently and regularly carried out; this is the real moral of this tragic epidemic.

The Growth of Public Expenditure

SIR ERNEST BENN, the chief proprietor of THE CHEMICAL AGE, was the guest of the Leeds Luncheon Club on Monday. He made some strong comments on the question of public expenditure. Sir Ernest said that whereas 19s. in the pound used to be left in the pockets of the people to fructify, now half the total national income went into the public purse and the other half was so tightly controlled, restricted, and regulated that there was little chance for any of it to fructify at all. Before the War, public debt represented about a third of private debt; now the position was reversed, and public debt was five times as great as private debt. Behind the private debt there was the flesh and blood of the individual, some reputation, character, and solvency, but there was nothing behind the public debt except a vain and pious hope that our grandchildren might be willing to pay it. "You have a revolution in size and importance overshadowing any of the revolutions you read about in the newspapers; a complete change in the foundation upon which we live," said Sir Ernest. "There is a call to-day for moral rearmament," he concluded. "I have always held that good economics and good morals go together. I regard a life that is dedicated to spending all and borrowing for anything else that is wanted as an immoral life, whether it is the life of an individual or the life of the nation."

Gas Temperature Measurement in the Chemical Industry

Choice of Pyrometer and Consideration of Maintenance

THE measurement of gas temperatures is necessary in the chemical industry for two distinct purposes, said Mr. J. C. Swallow, of I.C.I. (Alkali), Ltd., in a paper on "The Measurement of Gas Temperature in the Chemical Industry," presented to a symposium on Gas Temperature Measurement held by the Institute of Fuel at the Institution of Electrical Engineers, London, W.C.2, yesterday (Friday). First, to control chemical plant where the changes of temperature are used to alter the variables by which the plant is controlled, either by hand or by automatic control; and, second, for the determination of accurate heat-transmission coefficients and heat balances of plant, the data from which may be used for future design or for the tracing of unknown heat losses.

While the problems of measurement are similar in both cases, it is not, as a general rule, necessary to take the same elaborate precautions for the first, where only relative changes of temperature are of importance, while in the case of the second, high absolute accuracy may be very necessary.

There are no very elegant methods for the measurement of gas temperatures which are commercially applicable to chemical plant, but it would not appear that the progress of chemical engineering is seriously handicapped by this limitation. The problems of measurement are essentially similar to those encountered in the metallurgical, refractory and gas industries. Admittedly for purposes of control the indicated temperature of a gas is often very far from the true temperature, but represents a mean temperature which is, however, of considerable practical use. When such temperatures are used to control a continuous plant, a much more important factor than the accuracy of the indicated temperature is the life of the thermometer under the conditions in the plant, and its ability to maintain its characteristics without deterioration. Failure of the thermometer and the necessity for replacement may lead to stoppage of expensive plant.

It is natural, therefore, that in chemical industry more emphasis is placed on the problem of maintenance than of the obtaining of accuracy, and one of the aims of the paper, said Mr. Swallow, is to indicate, from experience of chemical plant control, where improvements would be most helpful.

Choice of Pyrometer

The thermometers used in practice are mercury in glass, mercury in steel, bimetallic elements which can give direct readings, thermo-elements, resistance thermometers and radiation pyrometers. For the measurement of the lowest temperatures met with in industrial practice, e.g., 190° C., the resistance thermometer is the most satisfactory for accurate measurement, but for less accurate work the copper/constantan thermocouple is perfectly satisfactory and maintains its characteristics with time. Above room temperature the thermocouple appears to be the most commonly used of all thermometers in chemical plant.

Iron/constantan has the advantage of cheapness and can be used up to 700° C. and for occasional use up to 800° C. in neutral and reducing atmospheres, and chromel/alumel is another suitable combination for this range in neutral and oxidising atmospheres up to 1,000° C.

Brightray/manganic can be used up to 1,000° C. in neutral and oxidising atmospheres, and for occasional use up to 1,100° C., but with this couple very complete protection against corrosion and gas attack is essential.

All these combinations require protection against gas attack and corrosion, the degree of protection increasing rapidly with increase of temperature.

Platinum/platinum-rhodium couples are employed for continuous use up to 1,200° C., but with this combination precautions against gas attack are necessary, usually involving the use of both inner refractory and an outer metal protective sheath.

A single thermocouple combination gives only a small change of electromotive force with temperature, which is normally measured by a moving coil millivoltmeter, which has the disadvantage of low sensitivity. Recording potentiometers which have been developed comparatively recently are a great improvement in this respect, and are used to an increasing extent in the control of chemical plant where close control of temperature over a narrow range of 5° to 10° is necessary.

Resistance thermometers can be employed at higher temperatures than are commonly recommended, but where the gases are corrosive they are generally avoided on account of expense. The characteristics of a resistance thermometer made from good quality platinum are generally maintained with age to a greater extent than those of a base metal thermocouple.

High Temperature Thermo-Elements

The great convenience of thermocouples as a method of temperature measurement has led to attempts to find thermo-elements suitable for use at temperatures higher than those at which the couples at present available are industrially useful, Mr. Swallow continued. The platinum-rhodium alloy is less readily contaminated than pure platinum, and couples of 5 per cent. rhodium-platinum alloy/15 per cent. rhodium-platinum alloy have been proposed. (*J. Iron Steel Inst.*, 1924, *110*, 94). Couples of platinum-rhodium alloy/tungsten, platinum-rhodium/molybdenum, tungsten or molybdenum/graphite, tantalum carbide/graphite and various other couples have been described, but none of these appears to be available in standardised form for installation in high-temperature chemical or metallurgical industrial plant.

In practice the advantage of the thermocouple over the resistance for the measurement of very high temperatures is illusory, since the necessity of protecting thermocouples from contamination and from accidental damage demands the use of sheaths that are impervious and robust. The high thermal capacity of the total weight of material in the protective sheaths nullifies the main advantage of the thermocouple, namely, its quick response to change of temperature.

The resistance thermometer, as already pointed out, has special advantages for purposes of temperature control. It is by no means improbable that it will displace the thermocouple for high-temperature measurements, and that its use will be extended well into the range of temperatures which at the present time is almost exclusively the field of the radiation pyrometer.

Radiation Pyrometers

Radiation pyrometers are of two main types: those which measure the total energy of the whole spectrum of the radiation emitted by the hot body or enclosure may be described as "total radiation" pyrometers; those which measure the intensity of a monochromatic radiation are generally described as "optical" pyrometers. The latter may be further classified into those which work on the disappearing filament principle, and those which depend on cutting down the radiation arriving from the source to be measured until a match with a source of constant brightness is obtained, as typified by the Wanner pyrometer. Each of these has its special advantages.

In the various pyrometers which are at present commercially available, the total radiation type has the advantage that it can be made recording. The observations are, however,

more subject to error due to departure from black-body conditions, and are in general less reliable as indicators of true temperature than observations made with the monochromatic or optical type for which corrections for departure from black-body conditions can more readily be made. It is sometimes possible to ensure black-body conditions for purposes of measurement by inserting a closed-ended tube into the furnace and sighting on the closed end. The length of tube, which must be at a uniform temperature, depends to some extent on the material of the tube, but in general must be about three diameters.

In the control of plant in which gas temperatures are measured, it is generally possible to simplify the problem by correct location of the thermometer.

The slow response of the temperature indicator is inherent in gas-temperature measurement. The heat is conveyed to the thermometer by convection and by radiation from the walls if they are hotter than the gas, and heat is lost along the thermocouple leads by conduction, and still more along the sheath which protects it. There is also the lag due to the transfer of heat from the sheath to the thermocouple through an air gap which inevitably exists, and the insulation round the wire. One obvious way of remedying this defect is to decrease the heat capacity of the thermometer, and consequently the conduction along the sheath, which is often only possible at the expense of the robustness of the thermometer, or to use the bare wires, but this is seldom possible because of the corrosion and contamination that inevitably occurs. Thus the indicator used in practice where it is protected by a metal or refractory sheath is generally a compromise in this important respect.

A very useful method for increasing sensitivity is sometimes employed, which consists of welding the tip of the thermocouple to the bottom of the protecting metal sheath. This has been found of great value when measuring exit gas temperatures from water-gas generators where the temperature fluctuates rapidly.

Difficulty of Time Lag

The other cause of lag in the measurement of temperature not associated with the indicator arises from the fact that, with a large chemical plant, changes in the indicator occur some considerable time after the change in conditions has been made, due to the size of the plant.

This difficulty of time lag is met with in all large chemical plants to varying extents, but is more noticeable in the case of gases where the stratification may increase the lag. Where it is necessary, therefore, to use a change of gas temperature to control a valve, a device must be used which is often described as anticipatory, or, more scientifically, two-term, control. Several satisfactory forms of control are now on the market, and one of them appears to be suitable for control from a thermocouple where the difficulty of amplifying the small electromotive forces produced has been overcome by converting a change in temperature to a change of pressure (Foxboro Stabilog). Satisfactory apparatus of this kind, which can be worked with a thermocouple or resistance thermometer for the control of relatively high temperatures, will probably find many uses in chemical industry, the author remarked.

Refractory materials for use with pyrometric installations may be required to serve one of three main purposes: electrical insulation both at low and high temperatures, protection of the thermocouple or resistance thermometer, or provision of a heated enclosure to serve as a "black body" in which measurements may be made with a radiation pyrometer. The properties mainly required for these three purposes are different. For the first purpose, insulation, chemical composition is all important; for the second purpose, gas tightness and mechanical strength are primary requirements but, since the protecting sheath will in most installations be in some form of contact with the thermocouple (even if the passage of material between platinum wire and protecting tube can take place only via the vapour phase) chemical composition is also important; for the third purpose a high degree of gas tightness is not required, but good mechanical strength at high temperatures, and ability to withstand steep temperature gradients and sudden changes of temperature without cracking are necessary properties. Severe vibration or rough handling of thermocouples with refractory sheaths is a complication in practice, since most impermeable refractory sheaths are brittle.

It is now possible to manufacture refractories suitable for the various requirements of pyrometer installations, from the refractory oxides, without the addition of clay. Several firms have started to manufacture refractories of pure alumina, which are at present considerably more expensive than porcelains, but their use is increasing.

Protection of Platinum Wires

For the protection and insulation of platinum wires at high temperatures, pure alumina insulators and pyrometer tubes are probably the most suitable of the various pure oxides available. The use of alumina as refractory may be expected to increase very greatly both the life and the useful range of platinum resistance thermometers and thermocouples.

After describing the compositions typical of the best porcelains and their limitations in use at high temperatures, Mr. Swallow considered the corrosion of metal sheaths. He said the chemical composition of fused silica renders it unsuitable for use in conjunction with platinum pyrometers at high temperature; where the gases are very corrosive and a gas-tight sheath is required, it is necessary to use heat-resisting metal. Quite apart from the harmful action which can be exerted on special steels by gases containing sulphur compounds and steam, consideration must first be given to the "free scaling" temperature under normal oxidising conditions. Mild steel begins to scale appreciably at temperatures over 600° C., and for prolonged service above such a temperature the use of alloy steels is necessary.

Good heat resistance is shown by chromium and chromium-nickel steels, and the ordinary 18/8/1/1 (tungsten, titanium) shows good resistance to oxidising conditions up to 900-950° C.; further improvement is obtained by addition of silicon and by increasing the tungsten up to 4 per cent. Where fuels containing 1 to 2 per cent. sulphur are being burnt, it is advisable to change over to the straight high chromium steels containing 30 per cent. Cr; the maximum temperature at which such materials can be used is raised to 1,100° C., by the additions of aluminium—the formation of a complex chromium-aluminium oxide skin exerting a protective action. The oxidising action of hot gases on the special steels may be accelerated by the presence of small amounts of substances such as lead oxide, sodium compounds, copper oxide, etc., which may exert a fluxing action on the oxide film.

Aluminium-Iron Alloy Surfacing

The use of aluminium-iron alloys on the surface of the metal as obtained in processes such as calorising, are useful for temperatures up to 950° C., and such coatings are resistant to sulphur-bearing gases. The straight iron-aluminium alloys, with and without small amounts of chromium (Feralloy) if they can be cast free from the skin and oxide defects give good resistance up to 1,050° C.

Absorption of carbon by iron-chromium and iron-nickel-chromium alloys in carburising atmospheres may cause serious embrittlement; this can be ameliorated by using low iron content nickel-chromium alloys of the 80/20 type, an example of which is "Cronite."

The affinity of chromium for nitrogen may also give rise to embrittlement in the synthesis of ammonia at high temperatures and in nitriding operations, where the use of alloys of high nickel content may be useful. The action of hydrogen under pressure at elevated temperatures can be very destructive; the subject has been fully dealt with elsewhere. (*J. Iron Steel Inst.*, 1938, *18*, 383).

The contamination of thermocouples as used in practice

may be due to corrosion by the gases or to permeability of the metal of refractory sheaths. A useful method of determining whether contamination has taken place when consistent errors are experienced consists of stretching the wire between two water-cooled clamps. A small flat coal-gas flame mounted on a moving carriage is then arranged to traverse the length of the wire, the ends of the wire being connected to a galvanometer. If the wire is contaminated, the steep temperature gradient in a small length of the wire causes a small current to flow.

Readings are taken over the whole length of the wire, moving the flame 1 in. or ½ in. at a time until the contamination is detected. Such a simple installation is of great help in determining whether contamination of thermoelement is taking place in chemical plant.

Bath of Molten Salts

Where a large number of thermocouples are used in chemical plant, it is often of great advantage to be in a position to calibrate against, say, a standard resistance thermometer. To immerse the thermometers to be checked in an air thermostat can lead to quite large errors due to the uneven distribution of temperature. It is more satisfactory to have a bath of molten salts consisting of an equimolecular mixture of potassium and sodium nitrates which is stirred, in which all the thermometers can be immersed. Such an arrangement is very convenient for temperatures up to 500° C., where the temperature can be easily varied and is to be preferred to the tedious calibrations at the fixed temperatures of the boiling point of water and sulphur. For calibration at higher temperatures of standard thermocouples, the melting points of gold and palladium can be used.

Finally, Mr. Swallow dealt with special problems which are met where true gas temperatures are required, and which necessitate the use of special apparatus.

A most difficult problem is to eliminate the effect of radiation on the thermometer. The only satisfactory way of eliminating this error is by using a "sucking" or high-velocity thermocouple in which the thermocouple itself is encased in a reflecting protecting tube, and the gases are sucked past the thermocouple at a high velocity. A number of satisfactory devices of this sort has been described in the literature, and provided sufficient precautions are taken, true "gas temperatures" can be measured up to 1,200° C. or 1,300° C. In normal chemical engineering practice, however, such devices scarcely justify the complication to provide the extra accuracy. Such a device is, however, preferable to the determination of temperature by thermocouples with wires of varying thickness, and extrapolating to the value for wires of negligible thickness.

Another problem which is becoming more important is the measurement of gas temperatures in high-pressure vessels where an exothermic chemical reaction is taking place with dissipation of heat through the walls. The sheath of the thermocouple must be capable of withstanding the pressure in the vessel, and in consequence is generally so thick that conduction along it is excessive, and the temperature measured is intermediate between that of the gas and the walls of the vessel. In such cases where true-gas temperatures are required, it is sometimes necessary to introduce the bare wires of the thermocouple through electrically insulated pressure-tight joints. Of interest in this connection is a method by which the leads can be taken into the vessel through glass insulators which are sealed into a high chromium steel. (*J. Sci. Instr.*, 1933, *10*, 247). This has been satisfactorily used for research purposes, but should be equally well applicable to chemical plant. (*Proc. Roy. A.*, 1934, *144*, 386).

OTHER PAPERS CONTRIBUTED TO THE SYMPOSIUM

The following are summaries of the other papers contributed to the symposium on Gas Temperature Measurement held by the Institute of Fuel. They will be published in full in the Institute's journal.

The Temperature of Gas—Its Meaning and Measurement. By J. G. Bennett and M. Pirani. The temperature of a gas is a well-defined magnitude only as applied to a system in thermal equilibrium in which there is equipartition of energy between all degrees of freedom. In nearly all cases affecting the practical engineer, there is no true thermal equilibrium but a "transflux" equilibrium, i.e., a flow of energy constant within the time limits of an observation. It may also happen that energy is not equally distributed among different classes of energy carrier. Such classes are designated, "Energy Flow Traps"—EFT's. A "pseudo-temperature" is defined as the measure of the energy in one EFT. Pseudo-temperatures often have practical significance for the engineer.

The Errors in Gas Temperature Measurement and their Calculation. By M. Fishenden and O. A. Saunders. The general problem of measuring the temperature of a gas is briefly discussed. Particular attention is then paid to measurements with a thermocouple, or other inserted instrument. Simplified curves are given for estimating the error due to radiation between a thermocouple and surrounding walls, for shielded and unshielded couples of different size and emissivities. A table of emissivities is given, with numerical examples showing the use of the curves. Comparisons are made with actual practice. Curves are also given for estimating the errors due to time lag when measuring fluctuating gas temperatures, and for calculating the error due to conduction of heat along the thermocouple leads. Some less common methods of measuring gas temperatures are also considered.

The Wall Effect in Gas Temperature Measurement. By C. H. Bosanquet. Errors in gas temperature determinations due to radiation from the walls and to conduction of heat along leads or sheaths are discussed and calculated. An estimation is made of the effect of shields and fins on the accuracy of measurement, and recommendations made as to the best way of making these improvements. It is concluded that a bare fine-wire couple is the most satisfactory when conditions permit of its use.

Significance of Flame Temperature

The Measurement of Flame Temperatures. By G. Ribaud, Y. Laure, and H. Gaudry. The significance of flame temperature and the principles of the different methods of measuring it are discussed. Methods employing an instrument introduced into the flame are considered, including the suction pyrometer, the extrapolation to zero size method, and heated wire methods. Optical methods for partially opaque luminous flames are described, including that of Kurlbaum and improvements on his methods, and also a photographic method. Non-luminous flames are discussed, particular attention being given to Féry's spectral line inversion method, its errors and improvements on it. The problems of measuring fluctuating flame temperatures and temperatures in an internal-combustion engine are also dealt with. A chemical method and one depending on thermal conductivity are also mentioned.

The Theory and Application of the Suction Pyrometer. By A. Schack. A mathematical theory is developed for suction pyrometers of normal design and with two concentric suction tubes. With certain assumptions, this treatment is extended to the case of a pyrometer surrounded by concentric rings of small suction tubes. Experimental results using the various types of instruments are outlined and compared with calculated values.

Optical Temperature Measurement of Luminous Hydrocarbon Flames. By Gerhard Naeser. A short description of the principles of colour pyrometry is given. It is pointed out that since the colour pyrometer is known to give a value for a flame temperature which errs on the high side, while the brightness or intensity type of pyrometer gives too low a value, an instrument which measures both at the same time is of considerable advantage. Such an instrument is described, and is independent of variations in the colour

sensitivity of the observer's eye. Measurements with the instrument of various types of flame temperatures are given. The method is confined to flames which have a continuous spectrum.

Metallic Materials for Thermocouples. By A. Schulze. A review is given of the progress made in recent years in the use of thermocouples for temperature measurement, and of the principles governing the choice of material for thermocouples. Section I deals with noble metal thermocouples, and includes the E.M.F.'s for couples made of alloys of a large number of types, with discussions of their suitability for different purposes. Section II deals in a similar way with base metal couples for measuring temperatures, high temperatures, and very high temperatures.

The Measurement of Temperature in High-Pressure Containers. By A. Michels and B. Blaisse. The problem of measuring the temperature of the contents of a pressure container is considered. Difficulties arise in cases where the contents and the walls are not in thermal equilibrium. The effect of pressure upon heat transfer is discussed. Several types of measuring devices used in practice are briefly described, including the thimble method, expansion thermometers, thermocouples, resistance thermometers and optical methods.

A Modified Aspirating Thermocouple for Gas Temperatures. By B. M. Larsen, G. Siddall, and K. Heindlhofer. The paper deals with a suction pyrometer for gas temperatures up to 2,500° F. The radiation shield takes the form of a refractory brick with small channels for the gas. Constructional details are given, together with operating results.

Errors in Gas Temperature Measurement. By A. F. Webber. The paper comprises two records of experimental work. In one of them—a hot blast main at an iron works—a substantial error was shown in conditions which should have favoured accuracy; in the other—a narrow water-cooled flue—the error, though expected, was of unforeseen magnitude, i.e., 1,000° F.

Producer Gas Temperature

The Measurement of Temperature of Producer Gas. By M. W. Thring. In order to test calculations on the temperature drop in producer gas mains it was necessary to know how closely readings of thermocouples in the gas corresponded to the actual gas temperature. A special assembly of three bare thermo-junctions was used for this purpose and found to give satisfactory results after certain precautions were taken.

The Measurement of Gas Temperatures in Glass Furnaces. By M. Parkin. An account is given of a series of experiments on temperature determination in the regenerator system of a glass furnace. A comparison is drawn between bare thermocouples of platinum and of base metals, a simple suction pyrometer and a heated junction thermocouple of the Schmidt type. It is concluded that bare platinum couples are most satisfactory for the purpose.

Gas Temperature Measurement in Boilers. By W. R. Hawthorne. The paper records tests with several types of thermocouple in the gas passages of a watertube boiler. The following instruments were used—rod-type sheathed couple, three bare-wire chromel/alumel couples of different wire sizes, a simple suction couple for temperatures up to 1,800°F., a water-cooled high-suction couple for higher temperatures, and a special banjo multiple platinum fine-wire couple with wire sizes varying from 0.02 in. to 0.004 in. diameter.

Application of Temperature-Measuring Equipment to the Measurement of Gas Temperatures. By S. Matthews. Recent developments in the field of industrial gas temperature measurement are considered. Special reference is made to problems relating to the use of radiation pyrometers.

Temperature Measuring Instruments. By W. Bowen. The paper reviews modern developments in temperature measuring instruments. These are dealt with according to the principles involved—resistance, thermo-electric, radiation and optical pyrometers.

Technically Useful Casein

Conditions Governing its Production

THE production of uniform casein by the coagulation of milk has been investigated by Gallay and Japp (*Canadian Jour. Res.*, 1938, *16*, 345-360). Laboratory, semi-technical, and full scale experiments were performed with the object of discovering the optimum conditions of coagulation of skim milk to give a casein of the most desirable characteristics for plasticising—the most important property being a high viscosity.

It was concluded that the skim milk must be fresh, that is its *p*H high, since then adsorption of inorganic salts by the casein occurs giving it a high viscosity. Shortly after coagulation, syneresis sets in and advantage can be taken of this to reduce the amount of organic material, such as lactose and albumen, in the liquor. The casein should be kept in suspension during coagulation and syneresis to prevent clotting and concomitant occlusion of organic substances. A temperature of 60° C. is the optimum for promoting syneresis. The casein is finally washed in repeated changes of warm water, and is thus obtained completely free from lactose and albumen, as is shown by the fact that no discoloration occurs on baking for four hours at 150° C.

The effect of *p*H on the flow characteristics of the product, which is very marked, cannot be entirely due to the effect of *p*H on the ash content, since reduction of the *p*H with hydrochloric acid results in the production of a casein which has a low viscosity, although the ash content is scarcely affected. The temperature of drying has, up to 80° C, very little effect on the viscosity of the casein.

Studies were also made of the extent of plasticisation of the casein produced in a small press of the extrusion type. The material must first be moistened, and here careful control of the amount of water added is necessary as it was found that an increase of the water content from 27.00 per cent. to 29.15 per cent. reduced the viscosity by 47.00 per cent. at 61,000 lb. per sq. inch. It was found absolutely essential to put baffles of some sort in the press, as otherwise the grains of casein simply flowed individually and no homogenisation was achieved. It appears that casein when liquefied under pressure, is subject only to streamline motion, which explains the difficulty of obtaining uniform mixing.

B.S. CHEMICAL SYMBOLS AND ABBREVIATIONS

THE British Standard Institution has just issued a British Standard List of Chemical Symbols and Abbreviations. The list is based on the Report of a Joint Committee of the Chemical Society, the Faraday Society and the Physical Society, which embodies the agreed views of British physicists and chemists. The list is divided into a number of sections comprising the Greek alphabet, mathematics, certain important physical constants, subscripts and other modifying signs, general physics and chemistry, heat and thermodynamics, electricity and magnetism, optics, units, elements and organic radicals. Copies of this British Standard (No. 813-1938) may be obtained from the British Standards Institution, 28 Victoria Street, London, S.W.1, price 3s. 6d. (3s. 8d. post free).

B.S.S. FOR MILD STEEL DRUMS FOR LUBRICATING OILS

A new British Standard has been published in the form of a B.S. Specification for mild steel drums for lubricating oils (No. 814—1938). The new specification covers drums of 3 up to 45 gallons nominal capacity in two classes; the first class for use generally in the home trade, and the second class, a slightly heavier drum, for export. Included in the specification are dimensional requirements with the permissible tolerances, while the clause relating to construction covers plain or corrugated drums, up to 12 gallons capacity, and above 12 gallons nominal capacity it is specified that drums shall be corrugated and have pressed out or deep swaged rolling hoops.

Wild-Barfield Electric Furnaces, Ltd.

New Research Department now in Operation

A NEW research department at the Elecfurn Works, North Road, London, N.7, of Wild-Barfield Electric Furnaces, Ltd., is now in full operation. The department is divided into two sections: the chemical research laboratory and metallurgical testing; and the equipment is the most up-to-date of its kind. In the laboratory, the analytical bench is a modern type of laboratory fitting with the central portion of the bench allocated for volumetric analysis, being constructed to take aspirators containing standard solutions, burettes, etc. This portion of the bench is white tiled, and contains a central sink with the usual 3-point tap fittings. On either side of the titration bench is the standard laboratory bench fitted with red tiles which are acid and heat resistant.

The furnace bench opposite to the analytical bench accommodates the following furnaces of the companies own construction. A solder bolt heater, which can also be used for general heating purposes, a laboratory muffle furnace of rectangular type for general purpose work being used up to temperatures of 1,000° C., and two small tubular muffle furnaces, one a single tube muffle and the other a double tube muffle furnace used for general chemical and metallurgical analysis, *e.g.*, carbon combustion, etc. The last three furnaces are hand controlled by means of the ordinary type of resistance and temperatures are indicated on a Foster multipoint pyrometer, with dual scale for both base metal and platinum metal thermo-couples, provision being made for 12 station measurements. There is also an electrically heated oven for use in general chemical analysis and is capable of going up to temperatures in the region of 200° C.; thermostatic control is incorporated. Each furnace is wired up through its resistance to wall plugs, each furnace and resistance being so arranged that they can be moved from place to place. Other electrical equipment comprises hot plates and an electrically heated still for the production of distilled water.

The central benches of the laboratory comprise two long tables of a standard laboratory pattern, but are not fitted with any of the normal services; they are used for general and clerical work. The laboratory, as well as the metallurgical testing section, is fitted with the usual services, power points; compressed air, etc., and is equipped with all the necessary chemicals likely to be required in metallurgical and chemical analysis.

The metallurgical testing section is equipped with a Vickers Pyramid hardness testing machine, a Hounsfield tensometer testing machine, a Hounsfield balanced impact machine, a Vickers projection microscope, and a Browning spectroscope. The section embodies a bench fitted with polishing equipment, a balance room and an optical dark room.

New Organo-Mercury Compounds

Stable in Presence of Oxygen and Metal Ions

THE alkylmercuri mercapto pyridine analogues of para-mercapto benzoic acid are receiving close attention in the United States as investigations indicate that they may be usefully employed as antiseptics and bacteriostatic agents. The ethylmercuri derivative has been found to prevent effectively the growth of *Staphylococcus aureus* in a dilution of one part in three and three-quarter million. Most ot the previously known mercapto compounds—both aliphatic and aromatic—are susceptible to oxidation by oxygen and the co-presence of almost infinitesimal amounts of metal ions, particularly the copper ion; this limits their usefulness by reason of the rapid deterioration which results. Even if the solution contains copper ions as low as one part in one million, deterioration is rapid and the antiseptic value is seriously affected. Moreover, it is impracticable, if not impossible, to prepare mercapto compounds and their solutions in a state entirely free from copper; manganese and iron also cause oxidative deterioration, although to a lesser degree.

L. A. Walter and R. J. Fosbinder, of the Maltbie Chemical Co., Newark, N.J., have found that certain heterocyclic mercapto mercuri compounds, such as 2-ethylmercuri thiopyridine 5-carboxylate, exhibit an unusual characteristic in that they are substantially resistant to auto-oxidation and oxidation catalysed by metal ions which are usually effective in promoting the deterioration of other mercapto compounds. From extended observations they have assumed that the unusual stability which is exhibited by these pyridine derivatives in the co-presence of metal ion catalysts is due to the formation of irreversible organo-mercuri compound-metal ion complexes, which are also catalytically inert. The inert complex thus formed, according to a paper which Walter and Fosbinder presented at a recent meeting of the Division of Medicinal Chemistry, American Chemical Society, involves the alkylmercuri group as the parent mercapto compound, 2-thiopyridine 5-carboxylic acid, is rapidly oxidised by oxygen both in the presence and absence of metal ion catalysts. This type of complex formation appears to be confirmed by the observation that an alkylmercuri thiobenzene compound normally suffering rapid deterioration in the presence of copper ions (one part in one million) is completely protected from such oxidation when sodium 2-ethylmercuri thiopyridine 5-carboxylate is added to the solution.

It is believed that 2-alkylmercuri thiopyridine 5-carboxylates are the first known examples of mercapto compounds which are substantially stable in the presence of oxygen and metal ion catalysts.

Two views of the new chemical research laboratory at the works of Wild-Barfield Electric Furnaces, Ltd. Left: part of the analytical bench; right: the furnace bench.

The Use of Bibliographies

By
W. P. DREAPER, O.B.E., F.I.C.*

THE use of bibliographies in research and industrial investigation was advanced a stage further, when the International Conference on Documentation, which was attended this year at Oxford by delegates from some thirty governments and representatives from 150 scientific and learned societies, devoted one of its sessions to this question. The use of bibliographies must increase for several reasons, the chief of which is the difficulty of consulting thousands of scientific and technical journals which are published in many different languages and countries.

In a previous article in this journal figures were given showing that one estimate indicated that three-quarters of a million worth-while articles or papers were published each year in 18,000 journals. Stringent steps are needed to cope with such a vast problem as the one of searching for information under such conditions. The same estimate, I believe, indicated that not more than a quarter of a million references in bibliographic form were published in all the world's journals; the other half a million articles were as good as lost to the ordinary reader.

Importance of Documentation

In considering the present arrangements made to "discover" the available information on any subject, it is useful to note a remark made at the above conference by its President, *viz.*, that side by side with this deficiency there was the important point that in a highly industrialised country such as ours, the nettle must be grasped, and documentation, as it is called, must rank equally with research. Otherwise, research might be repeated over and over again with a consequent loss of time and efficiency, or information already available might be overlooked in cases where it might be useful and important. For instance, one might picture a case where important interests were impaired in, say, a patent action, by one side not possessing so much information as the other. Or where an important investigation on research lines is undertaken by an individual, or group, of investigators ill-equipped with information which might be useful or even essential to success or failure.

This being so, the question, "How can a bibliography or bibliographies be prepared which may, under existing circumstances, bring the best results obtainable?" arises. In discussing this matter at the Oxford Conference with certain foreign delegates, it was quite clear that they had no illusions on this subject. They had found in their own countries that private industrial concerns, however large and extensive they might be, had abandoned the task in many instances of preparing such bibliographies themselves. The issue of future manufacture was too important to miss references which only a large organisation conducted centrally could obtain. Half a dozen important references missed out might bring about a serious position through their absence. Hundreds of additional references not known might bring disaster or great uncertainty to an otherwise sound position. Therefore, private firms had come to the conclusion that a central institution was the only solution.

Bibliographies might be reasonably divided into three sections:—

(1) Bibliographies prepared by the investigator himself by his own unaided work. This could only be satisfactory when the subject was a very restricted one, and the papers which had to be searched might only run to not more than 50 in number. This kind of search also may suffer from the fact that it cannot include reference to inter-related subjects which might also bring useful information bearing on the subject under consideration. In the case of a subject where thousands of such references might be consulted, if time and opportunity allowed, the position is hopeless for the individual investigator who relies only upon his own efforts. The uncertainty involved when a research is started on such lines is not lessened by the fact that others may be in a similar condition. It would be enormously increased, if one knew that in some other country there was information which was not available in our own case. When text-books were in preparation, the absence of one essential reference might modify the whole position covered.

(2) Bibliographies of general interest should be specially comprehensive and kept up to date at fairly frequent intervals. These may, in certain instances, run to 5,000 references or more, but experience has indicated that apart from the great expense involved in their preparation, it is better to divide up the subject under certain headings which have to be very carefully prepared. In any industry a library of bibliographies on general subjects running to, say, a thousand numbers in all, or, better still, to two thousand, will bring increased certainty to research and industrial investigation, to a degree hardly realised by those who do not possess such a medium of inquiry based upon knowledge in its most concentrated form possible To prepare such a bibliography large reserves of information and a highly specialised staff must be available. Experience has shown that better results are secured when a bibliography on a subject of more general utility which has been prepared in such a centre as the one indicated, is supplemented by a search for other references in a similar centre or centres situated in other countries. Here a maximum of five centres has been suggested. A search of this character might well be the equal to one covering years of search by an individual investigator, who, while he was making this, would be unable to carry on the research itself. A bibliography prepared on this scale becomes a document of striking significance and value.

(3) Bibliographies prepared by centres which specialise in one or a few subjects and have a library of, say, 5,000 volumes and a thousand journals, may have sufficient information to prepare bibliographies within a limited area like the one indicated. Yet even here, it might be advisable to supplement references so obtained, by others from other centres.

These three main forms of bibliographies might be supplemented, as in the case of the Central Agricultural and Scientific Bibliography, which operates from the science library, by bibliographies in other directions as well. In this way the whole of industrial science might be covered by a series of carefully tabulated bibliographies.

Argument Against Text Books

At the Oxford Conference opinions were expressed in favour of the bibliography, and, in some instances, against the text-book. The argument was that no ordinary text book could contain all the information required, and the tendency for a writer of a text book to obtain much of his information from other text books decreased the working efficiency of this source of information. It is not suggested here that this argument should be carried too far, or that a bibliography library should do anything more than supplement the ordinary activities of the library in the works or research department. At least, we may agree that all available facilities should be utilised to the utmost and efforts made to perfect a system under which bibliographic information is made as complete as possible. All this costs money, but the financial loss would be greater if other countries gain an ascendency in this direction.

* We regret to state that Mr. Dreaper died on December 2; an obituary notice appears on the opposite page.

Fish Albumen

German Production and Application

THE Deutsche Eiweissgesellschaft (German Albumen Co.) is now taking up the production of albumen from fish, working on a fairly large scale. It produces a dry albumen from fish which are not rich in fat. The product is free from taste and smell, and is to be available in grades suitable for foodstuff use and for technical purposes. It is stated that there are possibilities of using this fish albumen in the bakery and confectionery trade, in the making of macaroni, for preparing mayonnaise and sauces, and for use in sausages and ice cream. In industry the main applications appear to be in leather manufacture, size making, manufacture of albuminous paper and tissue paper, for certain photo-chemical products and in the artificial resin and enamel paint industries. Small quantities could also be absorbed for the manufacture of pharmaceutical and dietetic products.

Salt-water fish contain a high percentage of albumen and this has previously encouraged investigations into the possibility of extracting and utilising this albumen for food products. Calculated on a dry basis, saithe or coal-fish contain about 90 per cent. of albumen; cod contains 70 to 75 per cent., haddock 80 per cent. and herring 60 per cent. Manufacture of albumen from these fish also yields valuable by-products. The skins of treated fish are sorted out and if in good condition they can be subjected to a tanning process for the production of a useful fish leather, as employed in the making of gloves, shoes, belts and for book-binding. Skins which are unfit for the tanning process, as well as fish heads remaining after extraction of albumen, can be used for making fish glue, which is still in great demand, especially on the Continent, in spite of the introduction of various types of liquid glue utilising casein, etc.

Possibly the largest industrial use for fish albumen will be found in the production of staple fibre, as it has already been possible to produce a pure albumen fibre or "fish wool." An annual consumption of 20,000 tons of albumen fibre is predicted for Germany; this would necessitate the treatment of about 300,000 tons of fresh fish or about 40 per cent. of the annual German catch.

THE PILGRIM TRUST LECTURE

Professor L. J. Henderson, of Harvard, Foreign Secretary of the National Academy of Sciences of Washington, was in London in June, 1937, and discussed with the Officers of the Royal Society the possibility of increasing the opportunities of informal friendly contact between the members of the two bodies. The suggestion was made that an annual scientific lecture, to be given alternately in London and Washington by an American scientist invited by the Royal Society or a British scientist invited by the National Academy, would afford one such opportunity. The Pilgrim Trust was approached and very generously promised for six years an annual honorarium of two hundred and fifty guineas.

On December 8 the first Pilgrim Trust Lecture was given in London at the invitation of the Royal Society by Dr. Irving Langmuir, For.Mem.R.S., of the Research Laboratories of the General Electric Company, Schenectady, N.Y. In 1939 the second Pilgrim Trust Lecture will be given in America on the invitation of the National Academy. The Pilgrim Trust Lecture is at present an experiment for six years.

IN afforested regions in France the establishment of factories to make town gas from wood is being planned. Carbonisation at 1,000° to 1,100° C., as practised in the process receiving favourable consideration, will yield a gas with a calorific value of 4,000, while the wood charcoal obtained as a by-product could be used to drive motor cars. Profane is being used as a fuel to an increasing extent, and distributing depots have already been established at Longûyon, Valognes and Lamballe.

Death of Mr. W. P. Dreaper

A Pioneer of the Artificial Silk Industry

WE regret to announce the death, on December 2, of Mr. W. P. Dreaper, O.B.E., F.I.C., consulting chemical engineer. He was born in 1868 and educated at the Finsbury Technical College.

He was a pioneer in the foundation of the artificial silk industry in this country and had a world wide reputation due to the fundamental technical improvements which he introduced into the artificial silk manufacturing process. In 1896, in conjunction with H. K. Tompkins, he developed the production of artificial filaments from zinc chloride solutions of cellulose and thus initiated the manufacture of brilliant filaments from aqueous solutions of cellulose. More important than this, however, was his discovery of the advantages of stretch-drying. He found that the process increased the strength and the brilliance of the product, as well as controlling the denier. It was a natural step from this discovery

The late Mr. W. P. Dreaper.

to introduce the stretch while spinning; and this process is now applied wherever artificial silk is made from cellulose and its derivatives. He was also closely interested in natural silk, and was the author of a number of papers on the theory of dyeing, and the inventor of a process for the electrolytic production of designs on copper rolls for embossing fabrics, etc. He was at one time honorary consulting chemist to the Silk Association. During the war he was appointed superintendent of the Government factories at Sutton Oak (War Office) and Ellesmere Port (Ministry of Munitions).

He had served as a member of the council of the Institute of Chemistry and was a member of the council of the Society of Dyers and Colourists. At one time he was editor of the *Chemical World*, a journal which he started for Messrs. J. and A. Churchill; he also edited a series of text-books entitled "Text Books of Chemical Research and Engineering," and was author of "Notes on Chemical Research" and "Chemistry and Physics of Dyeing." Of recent years, he took an active interest in work associated with the preparation of bibliographies for research and industrial use and was honorary secretary of the Central Agricultural and Scientific Bibliography, the Science Museum. An article from his pen on the use of a modern scientific library was published in THE CHEMICAL AGE of August 14, 1937, page 139; we publish on the opposite page an article on the use of bibliographies which we received from him only a few days before his death.

EXTENSIVE bauxite deposits are understood to have been located on both sides of the River Upa, in the Schtschekino district of Tula, Russia.

The Ramsay Chemical Dinner

Importance of Chemistry in the Development of Modern Industry

THE annual Ramsay chemical dinner was held at the Central Hotel, Glasgow, on December 2; Mr. J. Davidson Pratt presided. SIR JOHN BOYD ORR, D.SC., director of the Rowett Research Institute and director of the Imperial Bureau of Animal Nutrition, proposed "The Profession of Chemistry." This was a difficult toast, he said, on account of the fact that chemistry itself was a terribly wide subject. It was fundamental to every one of the applied sciences, and almost all modern industries had their origin in some discovery in chemistry. For himself he was more concerned with biochemistry, and in that field the discoveries of the biochemist had led to things of the greatest benefit to the human race and to human welfare. In this connection he recalled what had been done with regard to food and medicine and in the production of fertilisers for the soil.

Rank and File Chemists

They honoured the great chemists—the Priestleys and the Ramsays—but he would like to remember also the rank and file of chemists who never rose to the rank of professor or had never been made Fellows of the Royal Society. After all, with regard to the honour granted to some of their great chemists it was really difficult to say to whom the honour belonged, as some discoveries were only made possible by the gradual increase of knowledge. The distinction associated with the great discoveries, therefore, should be distributed among the hundreds of routine workers by whom the discoveries were made possible.

In responding, MR. J. DAVIDSON PRATT also spoke of the importance of the work of the chemist for the benefit of civilisation. Referring to the position of industry at the present time, he said that the balance of trade was heavily against us. We must export more to pay for those things we required to import for our industries. This country, he added, used to export more and we did so for the reason that we made things which other people could not make. In former years it used to be in engineering that this country was pre-eminent, but in future it would need to be the chemist who would have to take first place. Mr. Pratt made a strong appeal to all chemists to join up with one or other of their professional bodies so that chemists all over the country could speak with one voice in matters affecting the profession.

CAPTAIN S. J. GRAHAM, general manager of the Empire Exhibition, replying to the toast of "The Guests," proposed by MR. F. RUMFORD, said the exhibition was one of the most successful ever held in the British Empire, and no industry had supported it practically, morally, and in some instances financially, better than the chemical industry.

ACTIVATED CARBON FROM BAGASSE

A new process has been developed in India which yields a satisfactory production of activated carbon from bagasse. The carbon is made by treating bagasse with zinc chloride solution and heating the mixture to a highly gelatinous dark-coloured mass. This is dried at the lowest possible temperature and then ignited in a suitable furnace at a definite temperature. This is of importance in determining the activity of the final product. When the volatile matter has been driven off the furnace is maintained at the optimum temperature for one-half to one hour, the mass is allowed to cool, is crushed, treated with hydrochloric acid, filtered, washed free of acid, dried, and is then ready for use. The zinc chloride is recovered and re-used, and attempts are being made to recover the hydrochloric acid. Preliminary calculations are said to show that the carbon produced is cheaper than that now imported and applications have been made for patents.

Chemical Matters in Parliament

Silicosis in Pottery Industry

IN the House of Commons on December 1 Mr. Ellis Smith asked the Secretary of State for the Home Department whether his attention had been directed to the high percentage of persons affected by silicosis in the pottery industry, what administrative action had been taken since the new Act came into operation and what further action it was intended to take.

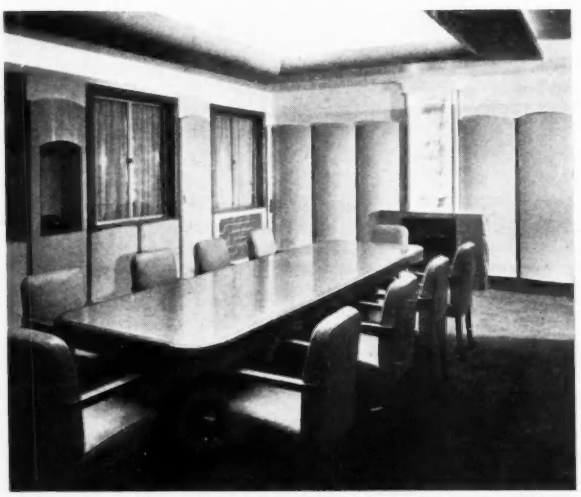
After stating that he had been advised that the conditions had greatly improved in recent years, the Under-Secretary of State for the Home Department (Mr. Geoffrey Lloyd) replied that the most important development as regards the future appeared to be the substitution, where practicable, of non-siliceous material. This was progressing satisfactorily and was being actively encouraged by the Department.

Land Fertilisers

In the House of Commons on December 5 Sir A. Baillie asked the Minister of Agriculture whether he was aware that the present scheme for providing cheap lime and basic slag to the agricultural industry was of no particular benefit to fruit growers, who required fertilisers of a different character; and whether he would consider the desirability of introducing a scheme for providing fruit growers with the fertilisers which they required at reduced prices on the same lines as the Land Fertility Scheme?

Mr. W. S. Morrison replied that the reasons for the assistance given under the Land Fertility Scheme for lime and slag were explained when the Agricultural Act, 1937, was before Parliament, and would not justify an extension of the kind suggested. Mr. Morrison also stated, in reply to Captain Plugge, that in his opinion circumstances were not such as to justify asking Parliament to consider legislation to extend the Land Fertility Scheme subsidy to include superphosphates as well as basic slag.

CATADYNISED water (*i.e.*, water treated with colloidal silver as a sterilising agent) has now been approved by the German Health Ministry for the manufacture of non-alcoholic beverages.



The new offices of Bakelite, Ltd., at 40, Grosvenor Place, Westminster, S.W.1., display to advantage the great possibilities of both Bakelite veneers and wall panels in modern interior decoration. The offices occupy a floor area of approximately 11,000 square feet and are grouped about two main corridors at right angles, forming an inverted L. The photograph above illustrates the unusual decoration of the board room, the wall panels in which take the form of a series of vertical convex panels finished in buff-coloured matt Bakelite veneer. The same material has been employed to surface the large conference table.

New Technical Books

STANDARD METHODS FOR TESTING TAR AND ITS PRODUCTS, Standardisation of Tar Products Tests Committee. Second Edition. Pp. xiii + 434. London: S.T.P.T.C., 166 Piccadilly, W.1. 21s. net, 21s. 6d., post free.

The second edition of "Standard Methods" represents a thorough revision, in every particular, of the first edition. The latter, published in 1929, was universally welcomed, both at home and abroad, and the sustained use of the standard tests bears witness to the fact that the Committee's original publication met a real need among producers, merchants and users of coal tar and its products.

Time has inevitably brought change; there have been readjustments in the relative importance of the various properties of coal tar and its constituents; experience among large numbers of users of the 1929 tests has resulted in desirable or essential modifications being brought to light; the increasing stringency of modern specifications demands increasing refinement in testing technique; new concepts of the relationship between physical characteristics and suitability in use have called for entirely new tests; new yardsticks have been adopted. Consequently, the second edition of "Standard Methods" is only in an incidental sense a merely polished form of the first edition. It represents a thorough overhauling of the whole of the earlier text in the light of modern experience, and the technique of many tests has been given a new form and significance. In addition, the new volume represents a considerable increase in the number of tests which it has been found necessary to standardise.

It will be seen, therefore, that the first edition has become obsolete and inadequate. The tests published in the new volume will in future represent standard practice (many have already been so recognised in recent and impending British Standard Specifications), while the 1929 versions can give little guide to the requirements of the new standards. Users of the 1929 tests and others who are concerned in the sale and purchase of tar and its products are, therefore, recommended in their own interests, to procure copies of the 1938 edition at the earliest opportunity.

BREWING: SCIENCE AND PRACTICE. By H. Lloyd Hind. Vol. I. Brewing Materials. Pp. 505. London: Chapman & Hall, Ltd. 50s.

This book will be found of use both by brewers and those engaged in the scientific side of brewing. The author has been more than ever impressed during its preparation by the wide additions to pure scientific knowledge that have originated in the endeavour to elucidate the mysteries of brewing, and by realisation of the inadequacy of our present interpretation of many of them. In his own words, he emphasises that brewing "is an art, not a science, and it would be presumptuous to attempt to teach it in any other way than by actual demonstration, but no artist is content to work in the dark to rules laid down by his predecessors. Guidance of the underlying scientific principles is sought and a study must be made of the hypotheses woven round them in attempts to explain the why and wherefore." It is stated that it is extremely difficult adequately to survey and to present in an intelligible manner the results of modern inquiries into the scientific principles of brewing. They cover such an immense field of research, that it is difficult to grasp them all and focus the discoveries of specialists in so many branches of science on to their practical application or to give a balanced view of theories, any one of which may appear to its originator as the panacea for many difficulties. The attempt to do this has therefore involved reference to the work of a very large number of investigators. Original sources, wherever possible, are given, but as these are scattered in various journals of so many languages, it has been thought equally desirable to add references to the abstracts which have been published in the *Journal of the Institute of Brewing*. Following a short historical introduction, the main section of the present volume deals with barley, the biochemistry of malt and wort, malt, sugar (including the subject of polarimetry), and brewing waters. The last-named section covers purity of brewing liquors, mineral constituents of liquors, liquor composition and beer character, water softening and decarbonation, and methods of liquor treatment based on *p*H control.

INDUSTRIAL CHEMISTRY. By William Thornton Read. Second Edition. Pp. 605. New York: John Wiley and Sons. London: Chapman and Hall, Ltd. 25s. net.

The present edition of this book follows the same general plan and arrangement as the first edition which was published in 1933, but nearly every page contains changes and a considerable part of the text has been rewritten. In the matter of illustrations special attention has been directed to the task of considering what equipment has now become obsolete, giving need for new illustrations. Individual chapters were sent to recognised authorities in particular fields, more than one hundred members of the chemical profession being approached for criticism and corrections. In consequence the present edition is a most comprehensive treatise upon chemistry viewed from the industrial standpoint. The subject matter of the twenty-seven chapters range from the relationship of chemistry to industry and the work of chemists and chemical engineers, through chemical economics, unit operations, materials of construction and power plant, to definite aspects of industrial chemistry, *i.e.*, sulphuric acid, fixed nitrogen, the silicate industries, fertilisers, electrochemical processes, metallurgy, petroleum, rubber, dyes, synthetic resins, etc.

The illustrations are numerous, a large number being line drawings with plenty of detail and lettered explanation. Many of these illustrations deal with features which really need explanation by illustration rather than by text. For instance, in the chapter which covers the subject of glass there are illustrations to show the method used for drawing sheet glass, with a larger detail of the actual means by which molten glass is first removed from the draw-pot. Again, in the chapter on power plant chemistry there is an illustration to show the general assembly of an oxygen bomb inside the calorimeter, with a cross-sectional detail for the bomb, showing the oxygen release valve, fuel firing cup, etc. The index to the book covers twenty-five pages. References to the literature of the various subjects have been omitted, although several thousand references were examined by the author in his search for detailed information; nevertheless, "sources of information" are discussed in a short chapter of six pages.

FLUORESCENCE AND PHOSPHORESCENCE. By E. Hirschlaff. Pp. 130. London: Methuen & Co., Ltd. 3s. 6d. net.

This is one of the series of small "Monographs on Physical Subjects," published under the general editorship of Dr. B. L. Worsnop, of which thirty-four titles have now appeared and four more are in preparation. In the present volume almost every aspect of fluorescence and phosphorescence is discussed, forty-two diagrams being included to elucidate certain parts of the text; each chapter, moreover, has a short series of references to sources for deeper reading. Following an introduction to the subject, the fluorescence of atoms and of molecules are dealt with separately. Fluorescence and photo-chemistry, and chemical reactions in the presence of optically excited atoms; the fluorescence of liquids and of solutions; the quenching of fluorescence in solutions; the photo-chemical aspect of fluorescence in liquids; fluorescence and phosphorescence in solids; the absorption and emission process in phosphors; and cathodo-luminescence are each discussed in turn as separate chapters. As in the case of other books in this series the text has been written for readers of average scientific attainment, with the intention of supplying a compact statement of present-day knowledge upon the subject concerned; nevertheless, certain parts of the book will

be of interest to those who are neither Honours students or active research workers. Both fluorescence and phosphorescence have already found considerable practical application, and the final chapter of the book recites a few examples which have developed in recent years. The fluorescence of nearly all organic substances, for instance, can be stimulated by visible or ultra-violet light; in consequence, the fluorescence microscope has become of considerable assistance in biological work. If a fluorescent liquid is injected into an animal body the internal organs will fluoresce and can then be observed in action. In the same way each substance in a leaf emits a fluorescence characteristic of that substance, and the structure of the leaf becomes visible under the fluorescence microscope in a manner which is not otherwise attained. Similar applications, in due time, may equally well develop in other directions, as with the investigation of raw materials containing minute traces of active agents which it is desirable to extract for some specific use, either medicinally or in certain branches of industry. It is only by a careful study of the facts—mainly physical—which have been collected together in this book, that scientific workers of the future may hope to achieve such results.

THE CHEMICAL ANALYSIS OF FOODS AND FOOD PRODUCTS. By Morris B. Jacobs. Pp. 537. London: Macmillan and Co., Ltd. 25s. net.

The author of this book has endeavoured to present all the salient facts of the chemical analysis of food and food products. Certain newer aspects such as the chemical assay of vitamins, the detection of improper pasteurisation and homogenisation of milk, the detection of gums, and methods for revealing new types of sophistication in foodstuffs have also been included. In the preface it is pointed out that many important analytical procedures have been entirely neglected in the literature, and that even the latest edition of methods published under the auspices of the Association of Official Agricultural Chemists in the United States makes no reference to the detection of improper pasteurisation nor to any chemical methods for vitamins although Tillman's method for vitamin C has been recognised since 1928. Apart from this the author has also endeavoured to deal with such topics as gums, jams and jellies, the presence of milk products in other foods, the presence of soya bean flour in meat, etc., which are of immense importance from an analytical aspect at the present moment and to which there are very few references in the literature. Throughout the book emphasis is laid upon short practical methods which are usable and which have proved to be efficient both in routine analysis and in general control work. The book is intended to serve as an educational text.

The author has been associated with the Food, Drug and Insecticide Administration of the Department of Agriculture in the United States, and has also been a member of the chemical staff of the Bureau of Food and Drugs, New York. Following two chapters dealing with general methods in analysis and physical-chemical methods, he passes on to the subject of colouring matters, preservatives, and the presence of metals in foods: these five chapters alone take up 143 pages of the text. Subsequent chapters deal with milk and cream; milk products (*i.e.*, butter, cheese, condensed milk, milk powder, ice cream, etc.); oils and fats; sugar foods and carbohydrates; gums, cereals and starch; jams, jellies and fruits; spices, flavours and condiments; non-alcoholic and alcoholic beverages; meat, fish and eggs; vitamins; and inorganic determinations, such as nitrates in fresh foods. Each chapter has a short bibliography, and throughout the book there are numerous tables showing variations in analysis for particular food products from different sources. There is an appendix of special analytical tables, and adequate subject and author indexes. The book should become one which will be frequently consulted in all laboratories where the chemical analysis of foods and food products constitutes a major part of the work.

Recent Trade Literature

A striking reproduction in colour of a "double-tap" at Teesdale Steel Foundry is a feature of a four-page illustrated folder issued by HEAD, WRIGHTSON AND CO., LTD. A cast steel spider, a cast steel pan casing, a propeller shaft and other products manufactured by the company are illustrated.

With the object of describing the extensive range of equipment supplied by JAMES HOWDEN AND CO. (LAND), LTD., for the new Fulham Power Station, a brochure has been issued by the company and is certain to prove of interest to those who are concerned with power plant installations and other industrial undertakings in which similar problems arise. The brochure contains a wealth of detail regarding the various features of the Power Station accompanied by illustrations.

The value of applying light to the best advantage in a factory, workshop or office is emphasised by the BENJAMIN ELECTRIC, LTD., in a booklet they have issued explaining the many factors that have to be considered in the installation of lighting. The Benjamin "Saaflux" system is claimed as a necessary adjunct to the trouble-free lighting system by reason of the fact that it ensures that the heat produced by the lamp is dissipated and not allowed to reach the cables, where it might, in course of time, cause them to perish.

A number of booklets recently issued by the MIRRLEES WATSON CO., LTD., in connection with their appliances include those dealing with two types of two-stage ejector air pumps, one with intermediate surface condenser and after heater, and the other with intermediate jet condenser. The ejector owes its popularity to its reliability as a high vacuum producer, and to its simplicity in build and operation. The types described in the publications have been designed with a view to obtaining maximum efficiency in the simplest possible manner. The only spares necessary are two steam nozzles which only require renewal at infrequent intervals. A short stroke dry air pump, barometric condensing plants and auxiliaries and spray coolers for sugar factories are among the other products featured in the company's booklets.

Fluid heat transmission by the Kestner patent "Merilene" system for heating to high temperatures without pressure is described in a leaflet, No. 258, published by the KESTNER EVAPORATOR AND ENGINEERING CO., LTD. Details are given of the general layout and working of the system which comprises three essential parts only: the absorber, circulating pump and expansion tank. The pump circulates the heating medium, which is a special grade oil, through the absorber, where the heat generated in the furnace is absorbed, and thence, through suitably designed pipe lines to the treatment vessels, etc. The function of the expansion tank is entirely automatic and is to allow for the expansion of the circulating oil due to changes in temperature. The company have also issued a leaflet, No. 255, describing the Kestner Flexo-mix stirrer unit, which is a small machine for general stirring and mixing requirements.

The use of electricity is to-day almost universal and the safe and continuous operation of electrical machinery and apparatus is therefore of the greatest importance. Breakdowns mean loss of output and inconvenience and therefore the avoidance of such breakdowns interest everyone using electricity. The safety of electrical installations and apparatus depends chiefly on the conditions of the insulation, and EVERSHED AND VIGNOLES, LTD., have issued a pocket book which explains how this condition can be ascertained by systematic testing of insulation by a Megger insulation tester. The pocket book gives simple instructions for carrying out tests and for recording the results in a log book. The firm have also issued a handbook on continuity and polarity testing which features the Electricity Supply Regulations 1937 which prescribes, in effect, that the electricity supply undertakings shall not permanently connect an installation unless they are satisfied that the connection would not cause a leakage exceeding one-ten-thousandth part of the maximum current to the installation.

Personal Notes

MR. H. SHATTOCK has been appointed cereal chemist in the agricultural section of the State Laboratories at Melbourne.

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MR. HAMPDEN BECKETT, managing director of J. M. Beckett and Sons, Ltd., chemical manufacturers, left estate valued at £25,652 (net personalty £20,383).

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MR. WILLIAM PARTINGTON, manufacturing chemist, managing director of Hart and Partington, Ltd., Radcliffe, left estate valued at £7,738 (net personalty £7,658).

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MR. WILLIAM HARDING SCOTT, chairman and managing director of Laurence Scott and Electromotors, Ltd., has left estate of the value of £82,949 (net personalty £75,190).

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SIR ARTHUR HENRY CROSFIELD, late chairman of Joseph Crosfield and Co., Ltd., soap manufacturers, left estate valued at £37,793 (net personalty £28,650).

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DR. N. T. M. WILSMORE, F.I.C., M.I.Chem.E., delivered the presidential address to the Australian Chemical Institute in Melbourne on November 15, when his subject was the history of the Institute.

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MR. F. STUBBS, manager of the Runcorn store of the Salt Union, was made a presentation by the staff on the occasion of his recent retirement. He has been associated with the works for more than 50 years.

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PROFESSOR ALEXANDER FINDLAY, who occupies the chair of chemistry at Aberdeen University, was entertained at lunch by representatives of the Australian chemical and related societies when he was recently in Melbourne.

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MR. THOMAS MIDGLEY, jr., vice-president of the Ethyl Gasoline Corporation, chairman of the board of directors of the American Chemical Society and discoverer of ethyl fluid, has been made a presentation in recognition of 15 years' service with the corporation.

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PROFESSOR AUSTIN M. PATTERSON, well known as the author of the German-English and French-English Dictionaries for Chemists, spoke upon the subject of chemical nomenclature at the November meeting of the Delaware section of the American Chemical Society. Professor Patterson has been chemical editor for Webster's New International Dictionary since 1903, and has served for several years on the editorial staff of Chemical Abstracts, being editor for the period 1909-14. He has represented the United States on the International Committee on Organic Nomenclature, and is a member of the National Research Council of the United States. He is now professor of chemistry at Antioch College.

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THE RAMSAY MEMORIAL FELLOWSHIP TRUSTEES have made the following awards of new Fellowships for the year 1938-9: DR. VERNON HOLLIS BOOTH (a British Fellowship of £300, tenable for two years, at Cambridge University); MR. DONALD MCNEIL (a Glasgow Fellowship of £300, tenable for two years, at Glasgow University); DR. ALFRED EPPRECHT (a Swiss Fellowship of £300, tenable for one year, at the Imperial College of Science and Technology, London). The trustees have renewed the following Fellowships for a second year: DR. A. E. ALEXANDER (British Fellow), at Cambridge University; DR. E. DE SALAS (Spanish Fellow), at University College, London; DR. J. J. HERMANS (Netherland Fellow), at University College, London; M. JEAN MONVOISIN (French Fellow), at the Royal Institution, London; MR. HAZIME OOSAKA (Japanese Fellow), at University College, London; DR. E. C. STATHIS (Greek Fellow), at the Imperial College of Science and Technology, London.

MR. NORMAN MACGREGOR MACKEEN, starch manufacturer, Parkgate, 21 Carriagehill Drive, Paisley, left estate valued £45,047.

MR. J. W. CHAMBERS, the Junior Technical Assistant of the Derby Gas Light and Coke Co., is leaving to become Industrial Gas Engineer to Rossendale Union Gas Co., Lancashire.

OBITUARY

MR. HARRY ASH MEGGITT, who was head of Samuel Meggitt and Sons, glue manufacturers, of Sutton-in-Ashfield, Notts, until it was acquired by the British Glues and Chemicals Co., has died at the age of 87.

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MR. DUNCAN M'KELLAR, who was chairman of James Burt Marshall, Ltd., bleachers, and chairman of Stevenson, M'Kellar and Co., bleachers and dyers, Pollokshaws, died recently at the age of 73.

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MR. WILLIAM WARR, who discovered how to make aniline black permanent, thus preventing goods dyed with aniline black from "greening," died last week at the age of 74. Mr. Warr was formerly head chemist at the Calico Printers' Association works at Buckton Vale, for 33 years, and among his greatest achievements was a process for the recovery of caustic soda from the mercerising machine. During the war, when there was a scarcity of sugar, Mr. Warr developed a simple process for making glucose from starch and enabled the branches of the C.P.A. to carry on when otherwise they might have had to suspend operations.

TO-DAY'S ANNIVERSARY

ALFRED BERNHARD NOBEL, Swedish chemist and engineer, died on December 10, 1896. As the first manufacturer of nitro-glycerine on a commercial scale, he originated the high explosive industry in 1862. Finding that the liquid explosive was very sensitive to shock and therefore difficult to handle, Nobel discovered that liquid nitro-glycerine could be mixed with kieselguhr and then transported and handled in comparative safety. The new product was introduced to the world in 1867, under the name of dynamite. In 1875 Nobel produced blasting gelatine by mixing nitro-cotton with nitro-glycerine. Continuing his work upon explosives, he followed up the invention of blasting gelatine with a mixture of gun-cotton and nitro-glycerine, with a small quantity of vaseline added; this appeared in England in 1889 under the name of cordite.

Foreign Chemical Notes

Hungary

IT IS PROPOSED TO EXPLOIT THE TITANIUM-IRON ORE DEPOSITS at Szarvaskö, one of the objects being to produce titanium in metallic form.

Norway

AN INCREASE IN SUPERPHOSPHATE PRODUCTION to 36,000 tons yearly is intended by the Lysaker Chemical Works following the recent prohibition of superphosphate imports.

Iceland

SULPHUR DEPOSITS NEAR NAMASKARD will be exploited by a company recently founded in Reykjavik. Commencing with 500 to 600 tons, it is intended to expand production to 4,000 tons per annum.

Holland

THE FOLLOWING CONCERNS have been granted permits to manufacture gasmasks: Technisch Bureau J. Duiker (The Hague), Vereenigd Industrieel Bezit Veritex N.V. (Nieuw-Milligen), Staatsbedrijf der Artillerie-Inrichtingen an der Hembrug (Zaandam), and the N.V. "Electro" Zuuren Waterstoffabrick (Amsterdam).

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Inorganic

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Copper naphthenate. Smith, *Soap, 14,* No. 11, 86-88.

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Colloidal clays. Hauser and Le Beau, *J. Phys. Chem., 42,* 1,031-1,049.

Organic

Alkenes by thermal decomposition of alkyl acetates. Wibaut and Van Pelt, *Rec. Trav. Chim. Pays-Bas, 57,* 1,055-1,058.

Alkyl chlorides from the corresponding alcohols. Whaley and Copenhaver, *J. Amer. Chem. Soc., 60,* 2,497-2,498.

Alkylation of naphthalene with alcohols. Price and Ciskowski, *J. Amer. Chem. Soc., 60,* 2,499-2,502.

Derivatives of decaline. Ganapati, *J. Indian Chem. Soc., 15,* 407-415.

Biochemistry of alcoholic fermentation. Nord, *Chem. Ztg., 62,* 769-772.

Melanoidines and their relation to humic acids. Enders and Theis, *Brennstoff-Chem., 19,* 402-407.

Stereo-isomeric hexaethyl cyclohexane. Koch and Steinbruch, *Brennstoff-Chem., 19,* 407-408.

Condensation of halogenated benzenes with unsaturated hydrocarbons. Truffault, *Comptes Rend., 207,* 676-678.

Fermentation process for dextro-lactic acid. Ward, Lockwood, Tabenkin and Wells, *Ind. Eng. Chem., 30,* 1,233-1,235.

Analysis

Determination of ferrous iron. Szebellédy and Madis. *Z. analyt. Chem., 114,* 249-252.

Determination of iron in mercury. Castiglioni, *Z. analyt. Chem., 114,* 257-260.

Pyrethrum evaluation. Lowman and Sullivan, *Soap, 14,* No. 11, 89-93, 119.

Determining lead in aluminium and its alloys. Winterhager, *Aluminium (Germany), 20,* 704-706.

Analytical separation of sugars. Hurd and Cantor, *J. Amer. Chem. Soc., 60,* 2,677-2,687.

Volumetry and accuracy. Duranton, *Ann. Chim. analyt., 20,* 257-261.

Analysis of commercial lead. Coakill, *Analyst, 63,* 798-805.

Estimation of rhenium in pyrolusite. Hurd and Hiskey, *Ind. Eng. Chem. analyt. ed., 10,* 623-626.

Determination of germanium in minerals and solutions. Aitkenhead and Middleton, *Ind. Eng. Chem. analyt. ed., 10,* 633-635.

Rapid method for gold in cyanide plating solutions. Kushner, *Ind. Eng. Chem. analyt. ed., 10,* 641-642.

Mineral Oils, Gas, Tar

Refining gasoline with solid phosphoric acid catalyst. Ipatieff and Corson, *Ind. Eng. Chem., 30,* 1,316-1,317.

Measuring oil tenacity at temperatures below 0° C. Schwaiger, *Petroleum Z., 34,* No. 45, 1-6.

Production and treatment of soft coal tar. Bube, *Chem. Ztg., 62,* 831-834.

Splitting of lighting oils by catalysis. Otin and Savencu, *Petroleum Z., 34,* No. 46, 1-5, No. 47, 1-5.

Cellulose, Paper

Sizing problems. Kurzhals, *Zellstoff u. papier, 18,* 588-590.

Montan wax in the paper industry. Hoyer, *Gelatine Leim Klebstoffe, 6,* 160-166.

Fresh water in cellulose manufacture and bleaching. Mehlo, *Papier Fabrik. (techn. Teil), 36,* 441-443.

Catalytic acetylation of cellulose. Krüger, *Nitrocellulose, 9,* 175-177.

Treatment of wood. Peschek, *Osterreichische Chem. Ztg., 41,* 418-420.

Bleaching, Dyeing, Finishing

Latex and textiles. Stern and Malden, *Rubber Age, 19,* 269-272.

Synthetic detergents. Jones, *Amer. Dyestuff Reporter, 27,* P621-624.

Corrosion resistant materials for bleaching vessels. Müller, *Melliand Textilber., 19,* 921-922.

Impermeabilisation of textiles. Lenoir, *Rev. Générale Matières Colorantes, 42,* 428-431.

Dyeing and printing Naphthol A.S. colours. Sonsone, *Text. Colorist, 60,* 734-737.

Estimation of acids in wool. Wakelin, *Text. Colorist, 60,* 754.

Bleaching of wool with sulphur dioxide and solutions of sulphites. Phillips, *J. Soc. Dyers Colourists, 54,* 503-512.

Calcium soap dispersing power. Ramachandran, Uppal and Venkataraman, *J. Soc. Dyers Colourists, 54,* 520-526.

Glass, Ceramics

Arsenic in glass melting. Zschacke, *Glass, 15,* 448-449.

Phosphate glasses. Knapp, *Glashütte, 68,* 778-781.

Dust dangers in the ceramic industry. *Sprechsaal, 71,* 561-563.

Metals, Electrometallurgy

Aluminium in steel manufacture. Bottenberg, *Aluminium (Germany), 20,* 690-695.

Aluminium in cast iron. Piwowarsky, *Aluminium (Germany), 20,* 696-699.

Plastic flow in metals. Bragg, *Proc. Roy. Soc., 168,* A, 302-316.

Sinter metals. Honisch, *Chem. Ztg., 62,* 829-831.

Corrosion protection by oil films. Scheiber, *Fette u. Seifen, 45,* 578-582.

Fats, Oils, Waxes

Thermal polymerisation of drying oils. Kappelmeier, *Chem. Ztg., 62,* 821-823.

Aluminium stearate base lubricating greases. *Rev. Prod. Chim., 41,* 609-611.

Eucalyptus oils. Silman, *Manuf. Chem., 9,* 352-353.

Detergents and wetting agents from fatty alcohols. Wakelin, *Manuf. Perfum., 3,* 346-347.

Paints, Pigments

Texture of coloured pigments. Craig, *Amer. Ink Maker, 16,* No. 11, 21-23, 39.

Determining the adhesive properties of paints. Rossmann and Schubbe, *Farben Ztg., 43,* 1,247-1,249, 1,272-1,274.

Pretreatment of metal surfaces for painting. Speller, *Paint Varnish Prod. Manager, 18,* 384-388.

Colour technique in industrial finishes. Rudd, *Paint Manuf., 8,* 350-352.

Alteration of surface properties of commercial carbon blacks. Murray and Bartell, *Paint Oil Chem. Rev., 100,* No. 23, 76-81.

Rubber, Plastics, Resins

Protein plastics from soybean products. Brother and McKinney, *Ind. Eng. Chem., 30,* 1,236-1,240.

Electrodeposition of rubber. Turner and Coler, *Ind. Eng. Chem., 30,* 1,282-1,284.

Free phenol and the yellowing of phenol-formaldehyde resins. Jacquinot, *Rev. Générale Matières Plastiques, 14,* 271-273.

New applications of synthetic resins. Jordan, *Fed. Paint Varnish Prod. Clubs Dig.,* No. 179, 432-439.

Vulcanisation without sulphur. Jacobs, *Rev. Générale Caoutchouc, 15,* 287-291.

Miscellaneous

Industrial chemistry and agriculture. Wagnet, *Rev. Prod. Chim., 41,* 612-615.

Retarding the detonation of dynamite. Stettbacher, *Nitrocellulose, 9,* 177-182.

General News—From Week to Week

THE NEW BENZOLE RECOVERY PLANT at Perth Corporation Gasworks has been completed and put into operation.

TWO CHINA CLAY PITS in the Lee Moor district, near Dartmoor, which were closed down about eight months ago, have re-opened and are being kept busy.

THE INTERNATIONAL TIN RESEARCH AND DEVELOPMENT COUNCIL has changed its address from Manfield House, 378 Strand, London, W.C.2, to Fraser Road, Greenford, Middlesex, telephone: Perivale 4254 (three lines).

THE WORKS, WAREHOUSES AND OFFICES OF HOWARD AND SONS, LTD., chemical manufacturers, Ilford, will be closed for the Christmas holidays from noon on Saturday, December 24, to Wednesday morning, December 28. The warehouses will also be closed on December 30 and 31 for stocktaking.

THE SHAREHOLDERS of the Old Castle Iron and Tin Plate Works, Western Tin Plate Works, Kidwelly Tin Plate Works and Ashburnham Tin Plate Works, all of which are situated in West Wales, approved, on December 2, the proposal to merge their companies into a new combine with a capital of £1,000,000. It is also proposed that the Teilo Tin Plate Co. be merged into the combine.

THE PILSWORTH BLEACHERY OF W. E. BUCKLEY, LTD., bleachers, dyers and finishers, Bury, one of the mills of the Bleachers' Association, Ltd., is to be closed in the near future for reasons of economy. The Association has informed the Town Clerk of Bury that the directors feel that they would be failing in their duty if they did not do everything in their power to cheapen production so as to be able to compete in the various markets of the world.

FOUR SPECIAL LECTURES under the general heading of "A Decade of Progress in the Electro-Deposition of Metals," are to be given by Dr. S. Wernick (hon. secretary, Electrodepositors' Technical Society) at the Northampton Polytechnic, E.C.1, on January 10 and 24, and February 7 and 21, 1939. The lectures are being given under the auspices of the Polytechnic's Department of Applied Chemistry. The fee for the series of four lectures is 5s.

THE SECRETARY FOR MINES announces the determination by the licensee of three prospecting licences granted under the Petroleum (Production) Act, 1934, and the Petroleum Production) Regulations, 1935, to the Gulf Exploration Co. (Great Britain), Ltd. The areas concerned consisted of two contiguous licensed areas which covered about 308 square miles in the counties of Somerset and Wilts, and one licensed area which covered about 130 square miles in the counties of York and Lancaster.

IN ACCORDANCE WITH THE PROVISIONS of Section 12 of the Gas Undertakings Act, 1934, the office of Gas Referees will be abolished on January 1, 1939, and, save as otherwise provided by the Act, their functions will thereafter be discharged by the Board of Trade at the Gas Testing Section, Chapter Street House, Chapter Street, London, S.W.1. Sir Charles Vernon Boys, F.R.S., and Mr. W. J. Atkinson Butterfield, two of the retiring Gas Referees, have been appointed under Section 12 (2) (b) of the Act to advise the Board as to the improvement of the methods and apparatus for testing gas.

RESULTS IN TERMINAL EXAMINATIONS IN CHEMISTRY at the Liverpool Technical College were a record, not only for the department, but for all chemistry departments of a similar nature throughout Great Britain, said Mr. A. E. Findley, head of the Chemistry Section, at the annual prize distribution on Monday. Lord Leverhulme, who distributed the prizes, said that one could not but be impressed by the opportunities offered to young men and women entering industry. Their training in the department of chemistry of the College, was such that if they were never again to see a test tube or a Bunsen burner, they would have acquired a habit of thought and a sense of values that would remain with them. He believed there was no finer training than a scientific training for those who found their duties to be concerned in what was called management.

THE FOLLOWING IS A LIST OF EXHIBITORS in the Chemical Section of the British Industries Fair (Olympia) to be held from February 20 to March 3, 1939: Albright and Wilson Ltd.; Association of British Chemical Manufacturers; Boake, Roberts, A., and Co., Ltd.; Boots Pure Drug Co., Ltd.; British Drug Houses, Ltd.; British Industries Solvents, Ltd. (with the Distillers Co., Ltd., and Methylating Co., Ltd.); Bush, W. J., and Co., Ltd.; Gas Light and Coke Co., Ltd.; General Chemical and Pharmaceutical Co., Ltd.; Hopkin and Williams, Ltd.; Howards and Sons, Ltd.; Imperial Chemical Industries, Ltd.; Johnson and Sons Manufacturing Chemists, Ltd.; Monsanto Chemicals, Ltd.; Newton Chambers and Co., Ltd.; Society of Chemical Industry; South Metropolitan Gas Co.; Spencer Chapman and Messel, Ltd.; Tyrer, Thomas, and Co., Ltd.; Whiffen and Sons, Ltd., and Williams (Hounslow), Ltd.

THE LIBRARY OF THE CHEMICAL SOCIETY will be closed for the Christmas holidays from 1 p.m. on Friday, December 23, until 10 a.m. on Thursday, December 29, inclusive.

GLASGOW CORPORATION INVITE TENDERS for the supply and delivery of two 11 ft. diameter mild steel acid stills. Specifications and drawings may be obtained from the Chemical Works Department, 30 John Street, Glasgow. Tenders, marked "Tender for Acid Stills—Chemical Works Department," are to be lodged with J. L. Mackenzie, Town Clerk, City Chambers, Glasgow, on or before December 22.

DR. D. G. ELSDON, chief inspector to the Joint Committee of the Rivers Mersey and Irwell, has reported that as a result of 1,994 visits to trade premises and 826 to garage works in the last two months it was noticed that a consistent improvement in the treatment of their trade wastes was being made by manufacturers generally. In one case a sum approaching £2,000 had been expended on the construction of a new purification plant, and this work was nearing completion.

THE ANNUAL CEREMONY at Marischal College, Aberdeen, of engraving an entry on a sheet of glass by means of hydrofluoric acid, was performed on November 25, by Dr. R. B. Strathdee, in the absence of Professor Alexander Findlay. Every year since 1855 the professor of chemistry at the University has made a similar engraving recording a notable national or local event. This year's entry reads: "28th September, 1938, New medical buildings at Forresthill opened by Lord Dawson of Penn."

THE TOTAL STATE CONTRIBUTION TO THE LAND FERTILITY SCHEME, from its inauguration on September 6 last year to May 31, was £1,071,000, states the first report of the Land Fertility Committee. Altogether 207,000 applications were received from 140,000 farmers, who had used 1,395,000 tons of lime and 409,000 tons of basic slag. Of the total State contribution, £826,000 was for lime and £245,000 for basic slag. The Committee estimates that the total quantity of lime used on the land was four times as great as in the previous season, and that the quantity of basic slag increased by 70 per cent.

THE 1935-37 EDITION of the Imperial Institute's "Statistical Summary of the Mineral Industry of the British Empire and Foreign Countries," which has recently been issued, contains 454 pages and gives statistics of the production, imports and exports of the 48 minerals and metals recorded in previous years. In addition, such statistics as are available have been added for bromine, selenium, tantalite and columbite, tellurium and zirconium minerals. The trade tables refer not only to the crude materials, but to the chief semi-manufactures and in many cases to the principal chemicals and their derivatives. Copies can be obtained from the Imperial Institute, South Kensington, London, S.W.7, price 7s. 6d. (8s. post free).

THE MINISTRY OF HEALTH HAS ISSUED A REPORT (No. 88) ON "LEAD IN FOOD," by Dr. G. W. Monier-Williams. The report deals comprehensively with the absorption, excretion, and storage of lead in the body; the lead content of food; a review of methods for the determination of lead in foods; and a general method for the determination of lead in food. The general method is a combination of the methods of Allport and Skrimshire and of Francis, Harvey and Buchan. It depends upon extraction of lead by dithizone and separation as sulphate, with subsequent colorimetric determination as sulphide, and is relatively quick and trustworthy for all foods. The report can be obtained from H.M. Stationery Office, price 1s. net.

WITH THE PUBLICATION OF A REPORT on the Main Seam of the North Wales coalfields (Fuel Research Survey Paper No. 45), the Department of Scientific and Industrial Research presents the forty-fifth report of the series dealing with the physical and chemical survey of the national coal resources, and adds a new field to those already covered by these papers. The main seam was selected as the first for systematic examination upon the advice of the local survey committee, representing the North Wales coal owners and the Department. Seven samples of the seam were taken and examined. The methods of analysis used were those of the British Standards Institution and the results are therefore strictly comparable with the results of the survey in other fields. The analyses are summarised and discussed at the end of the report, and each pillar sample is illustrated diagrammatically in the text. Copies of the Report are obtained from H.M. Stationery Office, price 2s. net.

Books Received

The Physical Properties of Colloidal Solutions. By E. F. Burton. London: Longmans, Green and Co. Pp. 235. 15s.

Unit Processes in Organic Synthesis. By P. H. Groggins, Editor-in-Chief. London: McGraw-Hill Publishing Co., Ltd. Pp. 769. 36s.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

METHOD OF RECOVERING LITHIUM SALTS from lithium-containing minerals.—Bolidens Gruvaktiebolag. (Sweden, Dec. 6, '37.) 32890.

DESTRUCTIVE HYDROGENATION OF CARBONACEOUS MATERIALS.—N. Booth. 32638.

MANUFACTURE OF SUPERPHOSPHATE FERTILISER.—Chemische Werke Rombach Ges. (Germany, Dec. 18, '37.) 33087.

SYNTHETIC RUBBER-LIKE MATERIALS.—R. B. F. F. Clarke, and Imperial Chemical Industries, Ltd. 33116, 33117.

DYEING OF TEXTILE MATERIALS.—Courtaulds, Ltd., C. M. Whittaker, and C. C. Wilcock. 32701.

INSECTICIDAL COMPOSITION.—Dow Chemical Co. (United States, Dec. 2, '37.) 32893.

PRODUCTION OF ORGANIC SUBSTANCES.—H. Dreyfus. 32677, 33304.

DISSOLVED ACETYLENE.—E. I. du Pont de Nemours and Co., N. D. Scott, and C. R. Harris. 32885.

VACUUM DISTILLATION.—Eastman Kodak Co. (United States, Nov. 13, '37.) 33030.

MANUFACTURE OF OXIDE OF IRON from green copperas.—A. J. Evans. 33281.

INTERCONVERSION OF GLYCERIDES.—E. W. Fawcett, and Imperial Chemical Industries, Ltd. 32614.

PRODUCTION OF VITAMINS.—E. W. Fawcett, and Imperial Chemical Industries, Ltd. 32616.

MANUFACTURE, ETC., OF PHOTOGRAPHIC SENSITISING DYES.—Du Pont Film Manufacturing Corporation. (United States, Nov. 11, '37.) 32747.

PRODUCTION OF ANTIOXIDANTS.—E. W. Fawcett, R. G. J. Fraser, and Imperial Chemical Industries, Ltd. 32615.

REFINING OF OILS, ETC.—E. W. Fawcett, R. G. J. Fraser, and Imperial Chemical Industries, Ltd. 32617.

CONVERSION OF FATS, ETC.—E. W. Fawcett, R. G. J. Fraser, and Imperial Chemical Industries, Ltd. 32618.

STABILISATION OF FATS, ETC.—E. W. Fawcett, R. G. J. Fraser, and Imperial Chemical Industries, Ltd. 32619.

MANUFACTURE OF MONOAZO DYESTUFFS.—J. R. Geigy, A.-G. (Switzerland, Nov. 13, '37.) 32858.

MANUFACTURE OF SYMMETRICAL CARBOCYANINE DYESTUFFS.—I. G. Farbenindustrie. (Germany, Nov. 10, '37.) 32683.

MANUFACTURE OF SYNTHETIC RUBBER-LIKE MATERIALS.—I. G. Farbenindustrie. 32760.

MANUFACTURE OF CATION EXCHANGE ARTIFICIAL RESINS.—I. G. Farbenindustrie. (Germany, Dec. 11, '37.) 32837.

MANUFACTURE OF HIGH MOLECULAR POLYMERISATION PRODUCTS. I. G. Farbenindustrie. (Germany, Nov. 12, '37.) 32979; 32980.

AUXILIARIES FOR TEXTILE FABRICS.—I. G. Farbenindustrie. (Germany, Nov. 29, '37.) 33179.

MANUFACTURE, ETC., OF OLEFINE OXIDES.—I. G. Farbenindustrie. (Germany, Nov. 18, '37.) 33338.

MANUFACTURE OF DYESTUFFS of the anthraquinone series.—I. G. Farbenindustrie. (Germany, Nov. 16, '37.) 33356.

PREPARATIONS COMPRISING ORGANIC SUBSTANCES.—G. W. Johnson (I. G. Farbenindustrie.) 33197.

MANUFACTURE OF AZO DERIVATIVES of substituted barbituric acids.—Kodak, Ltd. (Jan. 7.) (United States, Jan. 14, '37.) 33284.

PRODUCTION OF MAGNESIUM.—Magnesium Elektron, Ltd. (Germany, Jan. 24.) 33109.

PRODUCTION OF RESINS.—H. R. Moore. 33113.

PREPARATION OF A COMPOSITION for the anti-knock properties of gasolines.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, Dec. 6, '37.) 33088.

DISSOLVING, ETC., COPPER IN METALLIC FORM.—Norddeutsche Affinerie. (Germany, Dec. 20, '37.) 32752.

MANUFACTURE OF MARGARINE, ETC.—Schroder and Co., and R. Knollenberg. (Germany, Nov. 20, '37.) 33084.

MANUFACTURE OF PREPARATIONS HAVING A TONIC ACTION ON THE SKIN.—Soc. of Chemical Industry in Basle. (Switzerland, Nov. 17, '37.) 33310; (Switzerland, Nov. 5.) 33311.

LUBRICATING OILS.—Socony-Vacuum Oil Co., Inc. (United States, July 28.) 32711.

PRODUCTION OF VALUABLE DERIVATIVES from branched iso-olefines.—Standard Oil Development Co. (United States, March 8.) 32654.

TREATMENT OF GASES, ETC., in the presence of a metal catalyst. W. J. Tennant (Mino Business Trust.) 32982.

HYDRATION OF OLEFINES.—Usines de Melle. (France, Nov. 17, '37.) 33096.

REDUCING THE WATER-RETAINING POWER OF CELLULOSE PRODUCTS. Vereinigte Glanzstoff-Fabriken, A.-G. (Germany, Nov. 12, '37.) 33103.

PRODUCTION OF SODIUM OXALATE from sodium sulphate, etc.—G. N. White. 32862.

DISTILLING PROCESSES, ETC.—T. O. Wilton. 33193.

PROCESS FOR PURIFYING WATER, ETC.—R. Adler. 33707.

PROCESS FOR RECOVERING PHENOLS FROM WASTE WATERS, ETC.—R. Adler. 33708.

METHOD OF CONVERTING LIQUID HYDROCARBONS into a highly compressible dry gas.—R. Arnold. (Switzerland, Dec. 7, '37.) 33416.

PRODUCTION OF PHENOL-ALDEHYDE SYNTHETIC RESINS.—Bakelite, Ltd. (United States, Nov. 27, '37.) 34099.

ETHERS OF 1:4-DIHYDRIC PHENOLS.—W. Baker, R. F. Goldstein, and Imperial Chemical Industries, Ltd. 34083, 34084.

MANUFACTURE OF UREA-FORMALDEHYDE CONDENSATION PRODUCTS. Beck, Koller and Co. (England), Ltd. (Hovey, Hodgins, and Bevan). 33474.

PRODUCTION OF CARBON MONOXIDE.—British Oxygen Co., Ltd., and P. M. Schuftan. 33553.

SYNTHETIC RESIN MATERIALS, ETC.—N. A. de Bruyne, Aero Research, Ltd., and De Havilland Aircraft Co., Ltd. 33727.

PREPARATION OF WATER-SOLUBLE DOUBLE COMPOUNDS OF PURINE DERIVATIVES.—Byk-Guldenwerke Chemische Fabrik, A.-G. (Germany, Nov. 24, '37.) 34078.

SILICATE COMPOSITIONS, ETC.—J. Crosfield and Sons, Ltd. (Philadelphia Quartz Co.). 33917.

MEANS FOR LIQUEFYING PITCH, ETC.—Deutsch Eisenwerke, A.-G. (Germany, Nov. 29, '37.) 34017; (Germany, Aug. 16.) 34018.

PRODUCTION OF CHEMICAL COMPOUNDS.—H. Dreyfus. 33424.

PRODUCTION OF OXYGEN-CONTAINING ORGANIC COMPOUNDS.—H. Dreyfus. 33776, 33777.

PREPARATION OF AMINO-ALKYOXY-DIPHENYL DERIVATIVES.—L. S. E. Ellis (Soc. des Usines Chimiques Rhone-Poulenc). 34077.

STABILISATION OF FAT-CONTAINING FOODS.—E. W. Fawcett, R. G. J. Fraser, and Imperial Chemical Industries, Ltd. 33651.

UREA-FORMALDEHYDE MOULDING POWDERS.—J. Ferguson and Sons, Ltd., J. E. Ferguson, and S. A. Ede. 33448.

PRODUCTION OF MONO-ALKYLOL-KETONES.—J. G. Fife (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). 33475.

MANUFACTURE OF AZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 33928.

Complete Specifications Open to Public Inspection

EXCHANGE OR ELIMINATION OF ANIONS IN LIQUIDS and the adsorption of gases.—Auxilaire des Chemins de fer et de L'Industrie. May 21, 1937. 17452/37.

VULCANISATION OF RUBBER.—Wingfoot Corporation. May 15, 1937. 3528/38.

RESINOUS POLYSTYRENE suitable for moulding.—Bakelite, Ltd. May 18, 1937. 6457/38.

EXTRACTING AND REFINING GLYCERIDES and products resulting therefrom.—Pittsburgh Plate Glass Co. May 22, 1937. 6808/38.

METHODS OF MAKING COMPOUNDS OF THIOUREA and formaldehyde.—F. Pollak. May 22, 1937. 7268/38.

ELECTROLYTIC PRODUCTION OF PERSULPHURIC ACID and persalts and apparatus for carrying out the process.—Oesterreichische Chemische Werke-Ges. May 21, 1937. 9272/38.

TREATING TAR.—F. Krupp, A.-G. May 21, 1937. 10393/38.

MANUFACTURE AND PRODUCTION OF WATER-SOLUBLE BASIC ALUMINIUM COMPOUNDS.—I. G. Farbenindustrie. May 15, 1937. 14387/38.

METHOD OF PREPARING A PHOSPHORUS NITRIDE.—H. B. V. Maureu. May 15, 1937. 14454/38.

CATALYST FOR OXIDATION OF OLEFINE.—U. S. Industrial Alcohol Co. May 15, 1937. 14551/38.

MANUFACTURE OF AZODYESTUFFS.—I. G. Farbenindustrie. May 18, 1937. 14658/38.

MANUFACTURE OF SUBSTITUTED PERINAPHTHINDANDIONES.—Soc. of Chemical Industry in Basle. May 18, 1937. 14691/38.

MANUFACTURE OF DYESTUFFS containing metal.—Soc. of Chemical Industry in Basle. May 20, 1937. 14692/38.

MANUFACTURE OF NUCLEAR-ALKYLATED 6:6′-DINITRO-AND 6:6′-DIAMINOSTILBENE 2:2′-DISULPHONIC ACIDS.—Soc. of Chemical Industry in Basle. May 19, 1937. 14693/38.

MANUFACTURE OF DIAZO DYESTUFFS.—J. R. Geigy, A.-G. May 19, 1937. 14699/38.

METHOD OF PREPARING WATER-SOLUBLE DERIVATIVES OF THE INDOLE SERIES.—J. R. Geigy, A.-G. May 19, 1937. 14700/38.

MANUFACTURE AND PRODUCTION OF VALUABLE CONDENSATION PRODUCTS.—I. G. Farbenindustrie. May 18, 1937. 14729/38.

PRODUCTION OF METAL PHOSPHATES.—F. P. Kerschbaum. May 21, 1937. 15172/38.

MANUFACTURE OF MIXED RESINS for cation exchange.—I. G. Farbenindustrie. May 22, 1937. 15306/38.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. May 22, 1937. 15308-9/38.

MANUFACTURE OF DYESTUFFS.—Soc. of Chemical Industry in Basle. May 22, 1937. 15310/38.

MANUFACTURE OF DYESTUFFS.—Soc. of Chemical Industry in Basle. May 22, 1937. 15312/38.

PROCESS FOR THE MANUFACTURE OF AZO DERIVATIVES of substituted barbituric acids.—Kodak, Ltd. Jan. 14, 1937. 33284/38.

PROCESS FOR MANUFACTURING ARTIFICIAL FIBRE from protein contained in soy-bean.—Nihon Kari Kogyo Kabushiki Kaisha. May 25, 1937. 25217/37.

MANUFACTURE OF WAX MODIFYING AGENTS.—Standard Oil Development Co. May 26, 1937. 6235/38.

METHOD OF NEUTRALISING THE CONDITION-PRODUCING QUALITIES OF FINELY PULVERISED SILICIOUS MATERIALS.—J. J. Denny, and W. D. Robson. May 28, 1937. 10650/38.

MANUFACTURE OF ALIPHATIC KETONE-ANILS.—I. G. Farbenindustrie. May 27, 1937. 13147/38.

REMOVAL OF MERCAPTANS from hydrocarbon or derivatives thereof.—Naamlooze Vennootschap de Batafsche Petroleum Maatschappij. May 26, 1937. 13833/38.

MANUFACTURE OF VINYL HALIDES.—I. G. Farbenindustrie. May 28, 1937. 14588/38.

RECOVERING PHENOLS and its homologues from petroleum oils. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 25, 1937. 14596/38.

DEHYDRATION BY AZEOTROPIC DISTILLATION.—Usines de Melle. May 25, 1937. 15203/38.

MANUFACTURE OF WATER-SOLUBLE CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. May 24, 1937. 15240/38.

MANUFACTURE OF ARTIFICIAL RESINS hardening in the cold.—I. G. Farbenindustrie. May 24, 1937. 15464/38.

METHODS OF PRODUCING DOUBLE FLUORIDES of alkali metals and aluminium.—H. W. Heiser. May 24, 1937. 15467/38.

METHODS OF EXTRACTING FLUORINE VALUES from fluorspar ores. H. W. Heiser. May 24, 1937. 15468/38.

METHODS AND PROCESSES USED IN THE TREATMENT OF CELLULOSES and of peat, for the recuperation of the sugars and of the products formed during the treatment.—G. Meunier. May 24, 1937. 15512/38.

TREATMENT OF ZINC DUST for reducing the speed of reaction thereof in processes using it as a catalyst or reactant, and processes using zinc dust in this capacity.—Siemens and Halske, A.-G. May 27, 1937. 15642/38.

PRODUCTION OF COMPOSITE TITANIUM PIGMENTS.—E. I. du Pont de Nemours and Co. May 27, 1937. 15727/38.

PRODUCTION OF CALCIUM SULPHATE.—E. I. du Pont de Nemours and Co. May 27, 1937. 15728/38.

MANUFACTURE OF DRIERS for varnishes, lacquers, paints, and plastic masses.—I. G. Farbenindustrie. May 26, 1937. 15735/38.

MANUFACTURE OF SOAP and apparatus therefor.—Refining, Inc. May 28, 1937. 15870/38.

MANUFACTURE OF QUATERNARY AMMONIUM COMPOUNDS.—Deutsche Hydrierwerke, A.-G. May 27, 1937. 15909/38.

MANUFACTURE OF INSECTICIDAL COMPOUNDS and compositions containing them.—Imperial Chemical Industries, Ltd. Oct. 3, 1936. 34656/38.

Specifications Accepted, with Date of Application

PRODUCTION OF WATER-SOLUBLE CELLULOSE ETHERS IN POWDER FORM.—F. Sichel, A.-G. May 15, 1937. 495,173.

TREATMENT OF CLAYS.—Goonvean and Rostowrack China Clay Co., Ltd., and L. E. B. Pearse. June 3, 1938. 495,174.

SEPARATION OF OLEFINES from gaseous mixtures.—Usines de Melle. June 30, 1937. 495,304.

MANUFACTURE OF DIAMINODIPHENOXYANTHRAQUINONEDISULPHONIC ACIDS.—E. I. du Pont de Nemours and Co. May 20, 1936. 495,788.

CONVERSION OF HYDROCARBON MIXTURES.—A. L. Mond (Universal Oil Products Co.). April 9, 1937. 495,477.

PRODUCTION OF CELLULOSE ETHERS.—E. I. du Pont de Nemours and Co., and C. F. Wells. May 14, 1937. 495,825.

WATERPROOFING TEXTILE MATERIALS.—W. W. Groves (I. G. Farbenindustrie.) May 18, 1937. 495,829.

MANUFACTURE OF CONCENTRATED SULPHURIC ACID.—P. Parrish. May 18, 1937. 495,715.

QUINOLINE DERIVATIVES.—F. H. S. Curd, S. Ellingworth, and Imperial Chemical Industries, Ltd. May 18, 1937. 495,783.

CLEANSING OF PETROLEUM OIL in the recovery of benzole from coal gas.—C. P. Finn. May 20, 1937. 495,789.

MANUFACTURE OF POLYAMIDES.—W. W. Triggs. June 5, 1936. 495,790.

PREPARATION AND TREATMENT OF CALCIUM SACCHARATE SOLUTIONS. H. Pauling. May 20, 1937. 495,793.

CATALYTIC SYNTHESIS OF HYDROCARBON OILS.—Synthetic Oils, Ltd., and W. W. Myddleton. May 21, 1937. 495,575.

PRODUCTION OF METAL PHOSPHATES.—H. E. Girling (Legal representative of H. D. Elkington (deceased)). (F. P. Kerschbaum). June 5, 1937. 495,487.

PAINTS OR VARNISHES.—E. W. Welsh. June 16, 1937. 495,488.

MANUFACTURE AND PRODUCTION OF VAT DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) July 13, 1937. 495,661.

PRODUCTION OF MONO-AZO DYESTUFFS.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. July 23, 1936. (Samples furnished.) 495,662.

PREPARATION OF AROMATIC ISOTHIOCYANATES.—S. Goldschmidt, and K. Martin. Nov. 24, 1936. 495,510.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. Nov. 26, 1936. 495,672.

PROCESS FOR THE MANUFACTURE OF CONDENSATION PRODUCTS.—I. G. Farbenindustrie. Dec. 16, 1936. (Samples furnished.) 495,514.

SEPARATION OF TRIMETHYLAMINE from mixtures with monomethylamine and dimethylamine.—Rohm and Haas Co. Jan. 6, 1937. 495,516.

VULCANISING OF RUBBER.—R. A. Dufour, and H. A. Leduc. Dec. 19, 1936. 495,520.

PROCESS FOR THE MANUFACTURE OF EASILY WATER-SOLUBLE CALCIUM DOUBLE SALTS OF ASCORBIC ACID.—F. Hoffman-La Roche and Co., A.-G. Jan. 8, 1937. 495,675.

PREPARING ETHYLENE OXIDE and its homologues.—Soc. Carbochimique Soc. Anon. P. Ferrero, C. Vandendries, and F. Berbe. Jan. 6, 1938. 495,676.

PROCESS FOR THE MANUFACTURE OF DISUBSTITUTED CARBAMIC ACID ESTERS OF PHENOLS.—F. Hoffman-La Roche and Co., A.-G. April 24, 1937. 495,684.

PRODUCTION OF SUBSTANTIVE POLYAZO DYESTUFFS.—J. R. Geigy, A.-G. April 21, 1937. 495,552.

REMOVAL OF IRON from solutions of aluminium salts.—I. G. Farbenindustrie. July 16, 1937. 495,692.

PRODUCTION OF GREY CAST IRON.—H. J. Young. Feb. 10, 1937. 495,819.

PRODUCTION AND REFINING OF METALS or alloys.—Furnace Holdings, Ltd. (Buffalo Electric Furnace Corporation). Feb. 19, 1937. 496,041.

PRODUCTION OF A SUGAR-CONTAINING PRODUCT.—G. D. Turnbow. Jan. 4, 1937. 496,109.

DEPHOSPHORISING AND DESULPHURISING STEEL.—Soc. D'Electrochimie, D'Electrometallurgie et des Acieries Electriques D'Ugine. March 16, 1936. 495,868.

Chemical and Allied Stocks and Shares

THE new Stock Exchange account which began on Monday has not brought more active conditions to the stock and share markets. At the beginning of the week the small amount of business in evidence led to lower prices, but later these attracted attention and earlier losses were partly regained.

As a result of the surrounding tendency, Imperial Chemical have moved down to 30s. 1½d. at the time of writing, which compares with 31s. 6d. a week ago. Turner and Newall were lower at 77s. 6d., awaiting the past year's results, and United Molasses reacted to 20s. 9d., but the latter are now "ex" the recently-declared dividend. Murex at 77s. 6d. show a decline of 1s. 3d. on the week and Lever and Unilever have made the slightly lower price of 37s. Fison Packard and Prentice continued to transfer around 38s. 9d., and were a relatively steady feature, although they were less active this week. Cement shares were again out of favour and Associated Cement have gone back to 71s. 3d. at the time of writing, which compares with 75s. a week ago. Other shares of cement manufacturers also showed movements against holders. British Plaster Board were lower at 27s. 9d., but are "ex" the interim dividend.

The reduced price of zinc continued to affect sentiment in regard to Imperial Smelting ordinary, which have made the lower price of 11s. Birmid Industries shares were fairly steady, aided by the statements at the recent meeting. Babcock and Wilcox at 36s. 9d. are within 3d. of the price ruling a week ago. Michael Nairn at 61s. 3d. held their recent improvement, but Barry and Staines and Wall Paper deferred units were moderately lower on balance. Textile shares were less active and reflected the tendency to lower prices, but British Celanese continued to attract attention, sentiment being influenced by the statements in the report and the chairman's remarks at the meeting. Lancashire Cotton Corporation ordinary and preference became a steadier market later in the week. Results of the latter company are expected towards the end of the month or early in January.

Boots Drug remained steady at 40s., while Sangers made the better price of 22s. Timothy Whites and Taylors were slightly lower at 23s. 6d. Pinchin Johnson, Lewis Berger and International Paint shares were affected moderately by the reactionary trend of the Stock Exchange earlier in the week, but later prices tended to recover earlier losses. Triplex Glass again fluctuated rather sharply and are 31s. 6d. at the time of writing. Key Glassworks shares were held firmly on the larger dividend, but a lower price ruled for British Indestructo Glass shares on the decision of the latter company not to make a distribution in respect of the past financial period. Borax Consolidated changed hands around 27s. 3d. "Shell" and other leading oil shares declined sharply at one time, but subsequently a firmer tendency was shown.

Weekly Prices of British Chemical Products

TRADE in industrial chemicals has been on a very moderate scale this week, interest in spot or near delivery business being particularly subdued. On the other hand there has been a better inquiry for contract business and the volume of forward bookings is probably about normal for the season. Price conditions generally remain steady with no important changes in quotations to record. Contract renewals for sodium dichromate and potassium dichromate are being placed at existing rates and certain rebates for bulk quantities have been reintroduced for the first six months of 1939. Conditions in the coal tar section remain exceedingly quiet and buying generally is restricted to small parcels for near delivery. Quotations for most of the products continue at recent levels.

MANCHESTER.—There has been a certain amount of contract buying of chemical materials on the Manchester market during the past week for delivery over varying periods of next year, but in other respects trading conditions have been rather quiet and sellers report indications of the approach of end-of-the-year influences. Apart from some easiness in metal compounds in sympathy with the reaction on the metal markets prices are reasonably steady in all directions. There has been a moderate call for supplies against old commitments and the slight improvement in the demand for heavy chemicals for dyeing and finishing trades in Lancashire have been maintained. Buying interest in by-products has been slow in most sections and values have further eased.

Price Changes

Falls: Copper Sulphate (Manchester); Potassium Permanganate; Benzol, crude (Manchester); Cresylic Acid, Pale, 99/100%; Dark, 95%; Pale, 99/100% (Manchester); Pitch, medium, soft.

GLASGOW.—Business in general chemicals has continued on a rather quieter scale during the week both for home trade and export. There has, however, been a fair amount of interest for contract bookings up to June 30, 1939, and, in some instances, up to December 31, 1939, mostly on the same basis as prices ruling at present.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11¼d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0¼d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 2s. 6d. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2¼% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.), 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip), 7s.; levig., 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. to 10½d. per lb. SCOTLAND: B.P. Crystals, 10½d. MANCHESTER: B.P. 9¾d. to 11¼d.

POTASSIUM PRUSSIATE.—5½d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6¼d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

Soda, Caustic.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. **Scotland**: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£19-£20 per ton carriage paid North. **Glasgow**: £18 10s. per ton net ex store.

Sodium Bicarbonate.—Refined spot, £10 15s. per ton d/d station in bags. **Glasgow**: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. **Manchester**: £10 15s.

Sodium Bisulphite Powder.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£27 10s. to £32 per ton. **Glasgow**: £1 11s. per cwt., minimum 3 cwt. lots.

Sodium Dichromate.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

Sodium Chromate.—4½d. per lb. d/d U.K.
4d. per lb. **Glasgow**: 4½d. net, carriage paid.

Sodium Hyposulphite.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. **Manchester**: Commercial, £11; photographic, £15 10s.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £8 per ton for 6-ton lots d/d. **Glasgow**: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

Sodium Nitrite.—£18 5s. per ton for ton lots.

Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

Sodium Prussiate.—½d. per lb. for ton lots. **Glasgow**: 5d. to 5¾d. ex store. **Manchester**: 4½d. to 5d.

Sodium Silicate.—£8 2s. 6d. per ton.

Sodium Sulphate (Glauber Salts).—£3 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. **Scotland**: Ground quality, £3 5s. per ton d/d. **Manchester**: £3 12s. 6d.

Sodium Sulphide.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. **Manchester**: Concentrated solid, 60/62%, £11; commercial, £8 10s.

Sodium Sulphite.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Sulphuric Acid.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

Tartaric Acid.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. **Manchester**: 1s. 1½d. per lb. **Glasgow**: 1s. 1½d. per lb., 5%, ex store.

Zinc Sulphate.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.

Barytes.—£6 to £6 10s. per ton, according to quality.

Cadmium Sulphide.—3s. 2d. to 3s. 5d. per lb.

Carbon Black.—3¾d. to 4 1/16d. per lb., ex store.

Carbon Disulphide.—£31 to £33 per ton, according to quantity, drums extra.

Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.

Chromium Oxide.—Green, 10½d. to 11½d. per lb.

Diphenylguanidine.—2s. 2d. per lb.

India-rubber Substitutes.—White, 4¾d. to 5½d. per lb.; dark 3¾d. to 4½d. per lb.

Lamp Black.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

Lead Hyposulphite.—9d. per lb.

Lithopone.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

Sulphur.—£9 to £9 5s. per ton. **Sulphur precip. B.P.**, £55 to £60 per ton. **Sulphur precip. comm.**, £50 to £55 per ton.

Sulphur Chloride.—5d. to 7d. per lb., according to quantity.

Vermilion.—Pale, or deep, 5s. per lb., 1-cwt. lots.

Zinc Sulphide.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

Ammonium Sulphate.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

Nitro Chalk.—£7 10s. 6d. per ton up to June 30, 1939.

Sodium Nitrate.—£8 per ton for delivery up to June 30, 1939.

Concentrated Complete Fertilisers.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

Ammonium Phosphate Fertilisers.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. **Glasgow**: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. **Manchester**: Pure, 1s. 8d. per gal.; crude, 11½d. per gal.

Carbolic Acid.—Crystals, 6¾d. to 7¾d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10½d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

Creosote.—Home trade, 4d. per gal., f.o.r. makers' works; exports 6d. to 6½d. per gal., according to grade. **Manchester**: 3¾d. to 4½d. **Glasgow**: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6½d.

Cresylic Acid.—97/99%, 1s. 8d. to 1s. 11d.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 1s. 10d. to 2s.; Dark, 95%, 1s. 5d. to 1s. 6d. per gal. **Glasgow**: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. **Manchester**: Pale, 99/100%, 1s. 9d.

Naphtha.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. **Glasgow**: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

Naphthalene.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £11 per ton in 2-cwt. bags. **London**: Fire lighter quality, £3 to £4 10s. per ton. **Glasgow**: Fire lighter, crude, £6 to £7 per ton (bags free). **Manchester**: Refined, £12 to £13 per ton f.o.b.

Pitch.—Medium, soft, 30s. per ton, f.o.b. **Manchester**: 30s. f.o.b., East Coast. **Glasgow**: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

Pyridine.—90/140%, 12s. to 14s. per gal.; 90/160%, 9s. 8d. to 10s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. **Glasgow**: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. **Manchester**: 11s. to 14s. per gallon.

Toluol.—90%, 1s. 11d. per gal.; pure 2s. 3d. **Glasgow**: 90% 120, 1s. 10d. to 2s. 1d. per gal **Manchester**: Pure 2s. 4d. per gallon, naked.

Xylol.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. **Glasgow**: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £6 15s. to £9 5s. per ton; grey, £8 5s. to £8 10s. **Manchester**: Brown, £8s. 10d.; grey, £9 15s.

Methyl Acetone.—40.50%, £32 to £35 per ton.

Wood Creosote.—Unrefined, 6d. to 8d. per gal., according to boiling range.

Wood Naphtha, Miscible.—2s. 8d. to 3s. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.

Wood Tar.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.

Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.

Benzidine, HCl.—2s. 7½d. per lb., 100% as base, in casks.

Benzoic Acid, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-Cresol 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-Cresol 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-Cresol, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

Dichloraniline.—2s. 1½d. to 2s. 5d. per lb.

Dimethylaniline.—Spot, 1s. 7½d. per lb., package extra.

Dinitrobenzene.—7½d. per lb.

Dinitrochlorbenzene, Solid.—£79 5s. per ton.

Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

Diphenylamine.—Spot, 2s. 2d. per lb., d/d buyer's works.

Gamma Acid, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H Acid.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

Naphthionic Acid.—1s. 10d. per lb.

β-Naphthol.—£97 per ton; flake, £94 8s. per ton.

α-Naphthylamine.—Lumps, 1s. 1d. per lb.

β-Naphthylamine.—Spot, 3s. per lb.; d/d buyer's works.

Neville and Winther's Acid.—Spot, 3s. 3½d. per lb. 100%.

o-Nitraniline.—4s. 3½d. per lb.

m-Nitraniline.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-Nitraniline.—Spot, 1s. 10d. to 2s. 1d. per lb. d/d buyer's works.

Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

Nitronaphthalene.—9½d. per lb.; P.G., 1s. 0½d. per lb.

Sodium Naphthionate.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

Sulphanilic Acid.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

o-Toluidine.—10½d. per lb., in 8/10 cwt. drums, drums extra.

p-Toluidine.—1s. 10½d. per lb., in casks.

m-Xylidine Acetate.—4s. 3d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

ALUMINIUM CORPORATION, LTD., London, E.C. (M.S., 10/12/38.) Satisfaction, November 23, £159,000, registered June 28, 1933.

BLUNDELL SPENCE AND CO., LTD., Hull, paint and varnish manufacturers. (M.S., 10/12/38.) Satisfaction, November 23, £15,000, amount outstanding July 1, 1908.

BRITISH CELANESE, LTD., London, W. (M.S., 10/12/38.) Satisfaction November 25, of debenture stock registered June 21, 1934, to extent of £7,151.

INTERNATIONAL ALUMINIUM CO., LTD., London, E.C. (M.S., 10/12/38.) Satisfaction November 23, £212,000, registered June 28, 1933.

PREMIER BLEACHING CO., LTD., Preston. (M.S., 10/12/38.) Satisfaction November 25, of debentures registered April 28, 1922.

PREMIER DRUG CO., LTD., Manchester. (M.S., 10/12/38.) Satisfactions November 30, of charges registered March 13, 1930, March 6, 1931, mortgage registered March 23, 1932, and charge registered April 7, 1934.

SULFUROPHOSPHATE MANUFACTURING CO., LTD., Devonport. (M.S., 10/12/38.) Satisfactions November 26, of debentures registered February 26, 1937, to the extent of £1,200 "A" debentures and £2,500 "B" debentures.

Company Winding-up Voluntarily

PREMIER BLEACHING CO., LTD. (C.W.U.V., 10/12/38.) November 21. T. H. Bailey, chartered accountant, liquidator.

Forthcoming Events

London.

December 12.—Institution of the Rubber Industry. Joint meeting with the National "Safety First" Association. Northumberland Rooms, Northumberland Avenue, W.C.2. 7.30 p.m. R. G. Allsop, "Safety First and Accident Prevention in the Rubber Industry."

December 13.—British Association of Chemists. 101 Great Russell Street, W.C.1. 8.15 p.m. Dr. Joseph Needham, "The 17th Century Springtime of Science."

Institution of Chemical Engineers. Burlington House, Piccadilly, W.1. 6 p.m. C. Webb, "The Principles of Design of Modern Industrial Furnaces."

Pharmaceutical Society. 17 Bloomsbury Square, W.C.1. 8.30 p.m. W. G. Templeman, "Plant Growth Hormones and Their Uses."

December 15.—Chemical Society. Royal Institution, Albemarle Street, W.1. 6 p.m. 17th Faraday Lecture. Dr. Irving Langmuir, "Monolayers on Solids."

December 19.—Chemical Club. 2 Whitehall Court, S.W.1. 8.15 p.m. Professor H. D. Kay, "Unspilt Milk."

Birmingham.

December 13.—Institute of the Plastics Industry. James Watt Memorial Institute, Great Charles Street. 8 p.m. W. G. Wearmouth, "Production and Uses of Celluloid."

December 14.—Institute of Chemistry (Birmingham and Midlands Section). Dr. J. Newton Friend, "Priestley."

Edinburgh.

December 16.—Institute of Chemistry and Society of Chemical Industry (Edinburgh and East of Scotland Sections). North British Station Hotel, Princes Street. 7.30 p.m. W. A. Broom, "Some Recent Advances in Biochemistry and Medicine."

Liverpool.

December 16.—Society of Chemical Industry. The University. 6 p.m. Hurter Memorial Lecture. W. A. S. Calder, "Why a Chemist?"

Manchester.

December 12.—Institute of the Plastics Industry. Engineer's Club, Albert Square. 7.30 p.m. J. Butler, "Ancillary Processes in the Moulding Shop."

December 15.—Institute of Chemistry. Constitutional Club, St. Ann Street. 7 p.m. Professor J. Read, "Humour and Humanism in Chemistry."

December 16.—Manchester Literary and Philosophical Society (Chemical Section) and Society of Dyers and Colourists, 36 George Street. 7 p.m. Professor F. M. Rowe, "The Life and Work of Sir William Henry Perkin."

Newcastle.

December 13.—Institute of Metals. King's College. 7.30 p.m. R. Givern, "Aluminium Alloys in the Foundry."

Stoke-on-Trent.

December 12.—The British Ceramic Society (Pottery Section). North Staffordshire Technical College. 7.30 p.m. A. Guy Harris, "Observations on Some Causes and Effects of Vitrification in Ceramic Bodies."

Company News

Canadian Celanese, Ltd., have declared a dividend of 75c. per common share.

The International Nickel Co., of Canada, have declared a regular dividend of $1.75 on the preferred stock.

Midland Tar Distillers, Ltd., have declared an interim dividend of 3 per cent., free of tax, on the preference capital.

Boots Pure Drug Co., Ltd., are again paying a quarterly dividend of 6 per cent., less tax, for the period ending December 31.

The Metal Box Co., Ltd., are maintaining their interim ordinary dividend at 5 per cent., less tax, for the third successive year.

Key Glassworks, Ltd., have declared a final dividend of 11 per cent., with a bonus of 5 per cent., making 23 per cent., less tax (21 per cent.).

Bleachers' Association, Ltd., have deferred the interim payment on the preference stock, arrears of dividend on which date from January 1, 1934.

The Celanese Corporation of America has declared a dividend of $5 on the 7 per cent. participating preferred stock, compared with $2 previously.

J. and E. Hall, refrigerating machinery manufacturers, are to acquire the refrigeration business of the Liverpool Refrigeration and Engineering Co., including that of their subsidiary, H. J. West and Co.

Bradford Dyers' Association, Ltd., are postponing the dividend on the preference stock for the six months ending December 31, but interest on the 4 per cent. debenture stock will be paid as usual on January 2.

Power-Gas Corporation, Ltd., report for the year to September 30 a balance of profit of £38,977 (£31,356); to reserve, £7,795 (£6,270), dividend, 10 per cent., less tax (8 per cent.); forward, £15,313 (£14,131). Meeting, 39 Victoria Street, S.W., December 14.

Anglo-Chilean Nitrate Corporation have announced that the distributable net profits for the year ended June 30 last amounted to £397,157 (£426,814). Of this amount £202,043 will be paid out in interest at the rate of 4½ per cent. on both the Sterling First Mortgage Income debenture stock and the dollar issue of Sinking Fund Income debentures.

The Chilean Nitrate and Iodine Sales Corporation report for the year to June 30, the proceeds from nitrate and iodine sales increased from £6,610,050 to £6,881,850, but as a result of increased cost of production profits work out at £2,265,351 (£2,415,042). After deducting £566,338, the amount due to the Chilean Government, £1,699,013 (£1,811,281) is available for producers.

British Benzol and Coal Distillation, Ltd., for the year ended October 31, show trading profit £78,808 (£78,737); net profit, after allowing £13,531 for depreciation and making reserve for repairs and obsolescence of £6,900, is £50,312 (£56,764); dividend, 10 per cent. (same), bonus, 5 per cent. (2½ per cent.); forward, £19,064 (£12,546). Meeting, Winchester House, December 15.

British Oxygen Co., Ltd., have declared a dividend of 3½ per cent. on 6½ per cent. cumulative preference for the half year ending December 31, and dividend of £1 13s. 8d. per £100 stock on 5 per cent. cumulative second preference, being dividend of 5 per cent. per annum calculated to December 31, on amounts paid on application and allotment from July 12, and on final instalment from September 30, both less tax, payable December 31.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Belgium.—A well-established firm of agents at Brussels wishes to obtain the representation, on a commission basis, of United Kingdom suppliers of chemical fertilisers, chemical products for Belgium. (Ref. No. 414.)

Bulgaria.—An agent in Sofia wishes to obtain the representation of United Kingdom manufacturers of tin plates, cast and foundry iron, iron and steel sections, non-ferrous metals. (Ref. No. 415.)

Sweden.—An agent established at Gothenburg wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of dry paints for the whole of Sweden or Scandinavia. (Ref. No. 419.)

Switzerland.—A firm of agents established at Zurich wishes to obtain the representation to purchase on own account of United Kingdom manufacturers of pharmaceutical and chemical-technical products for Switzerland. (Ref. No. 421.)